Australian Model Engineering

July-August
1995

Issue 61

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LOCOMOTIVES, TRACTION & STATIONARY ENGINES, BOATS, WORKSHOP, PRODUCTS, CLUB NEWS & EVENTS, REVIEWS

In This Issue:
- ☑ The 1995 AALS Convention Report
- ☑ An Excursion into Amateur Clock Making
- ☑ 422 class Diesel Engine Sound Simulator

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The Cover

Joe Huntley preparing his Bolton Trophy winning NSWGR 3633 for another day of live steam. Although not a particularly good photo, it was chosen to show some of the detail that has gone into the production of this model. Just about everything on the full-size C36 class has been reproduced in miniature.

Photo: Brian Carter

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Build your own model gas turbine! This wonderful book explores the theory and parts of gas turbines, and then shows how you can build one - the author's FD3/64 engine. Whilst the book relates to aircraft gas turbines, the clever amongst you might be able to amend such an engine for marine use. In its German original, this book caused a big stir in "Strictly I.C." magazine - now you can buy an english language edition - and buy it now! Very nicely produced and illustrated 106 page paperback.

Locomotive Valves & Valve Gears {1921} [Yoder & Wharen] £18.15
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Nelson's life, victory and times have been extremely well documented, but very little has been published on his ships. This book, now in its twelfth printing, corrects this omission and does give a huge amount of detail. 271 detailed line drawings, 48 photos and 7 fold out plans. 296 pages. Hardbound.

De Re Metallica {1556} [Agricola] £23.75
Originally published in 1556, this was one of the earliest technical books ever produced, and certainly the first on mining to be based on field research and observation. Its detailed technical drawings were the first to illustrate the many branches of mining and to provide a realistic history of mining from antiquity to the mid-sixteenth century. Still regarded as an authoritative work today, it was this books translation from the original Latin in 1912, that brought it to a wider public; it is this edition that is reprinted here, **complete with all 289 original woodcuts.** This book really does give an extraordinary picture of the first age of technology in its 638 pages. Paperback.

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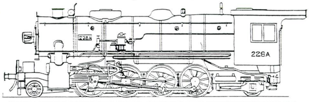

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Comment

A New Era?

Over the last few years, many model engineers have been building very accurate reproductions of specific prototypes — steam plant, boats and ships and of course our miniature (and not so miniature) locomotives.

While this re-creation of objects past contributes much enjoyment for many in the hobby, what are the prospects for the future?

Radio control we already have, but it should be only a matter of time before our model tugboats will have a Programmable Logic Controller (PLC) which controls engine power and the thrust through either a Voith-Schneider or Z-peller system. Realistic sound which ramps up with power is not too far away either! Warships with simulated operations of weapons systems. Roll-on-Roll-off and heavy lift ships with automatic ballast trimming are other possibilities.

Recent advances in permanent magnet motor technology and their control systems will soon see more powerful battery electric locomotives on the track. New-generation battery chargers will also see more efficient charging and longer operational cycles. All by courtesy of modern industrial electronics.

A designer in Victoria is already running petrol-powered and battery-electric locomotives as multiple units! Miniature electronics and stepper motor control of the petrol engine throttle makes this possible.

From South Australia we hear there is a dynamometer car under consideration. It's no ordinary car with levers, springs and a pointer on a calibrated range device. Instead it has fully electronic pressure and speed sensing hooked up to an on-board laptop computer which has a program installed to turn all the incoming data into terms we can understand and store it on disk for future evaluation. Accurate performance testing of our motive power has arrived!

Worldwide industry miniaturization of control hardware and electronics is making this equipment ideal to adapt to our purposes. The ever-falling cost of electronics components and computer hardware should see it used increasingly for model engineering.

So, if you're interested in a more modern (and probably exciting, if only because it is unknown) side of model and experimental engineering, its out there waiting for you, the world of 555 timers, flip-flops, PLCs, A-D converters — and more!

Just imagine, sitting back behind your "Dash-8", a low rumble coming out from under the loco as it sits in low idle. You pop the horn and nudge the throttle up to notch 8, the turbo charger winds up, the engine noise and revs increase and the train slowly moves off as power is gradually increased and applied to the traction motors. Fantasy you say? No, it's already a fact in HO scale!

Model engineering in the future will be relying on the results of more experiments and developments in this area, we'll be operating equipment with realistic operational characteristics that, so far, have been unattainable.

Er, where was I? Must return to the garage and finish brushing the tubes of my steam loco, in preparation for the next run.

Neil Graham

To our new reader

If this is your first issue of Australian Model Engineering, welcome! We hope you'll look forward to the ideas, news and camaraderie in each bi-monthly issue.

One of the great things about our hobby is the way model engineers actively help each other. Unless you live in an isolated community, you'll soon discover who has valuable experience in your field of interest, or who will help you to make a part that's too big for your workshop machinery. Look in the *Club Roundup* section to find a club that's near to you; pay a visit and you'll usually find model engineers who live not too far away. Then you can experience the great fellowship that makes our hobby special.

This magazine is prepared in the same spirit of "model engineers helping each other". About two dozen people put many hundreds of hours work into each issue — all on a voluntary basis — to help model engineers in Australia and New Zealand keep up to date and stay in touch.

We rely on our readers to write articles for us — for the same (non-existent) rate of pay! If you have ideas or techniques that you feel would be interesting to others, please drop us a line. We'll gladly help with preparation of artwork or editing if that's necessary. Most important of all, please support the people who advertise in our magazine. Without them to pay the bills, you wouldn't be reading this!

Brian Carter

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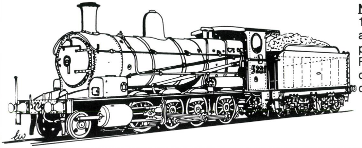

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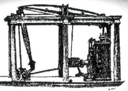

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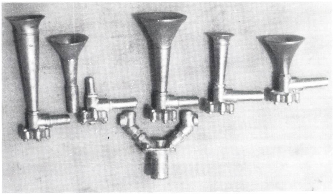

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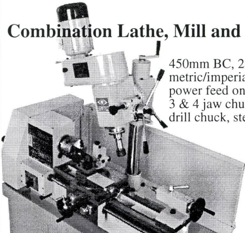

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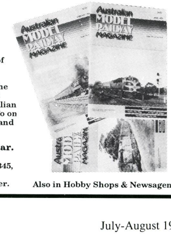

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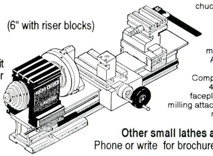

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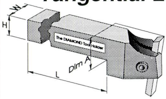

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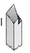

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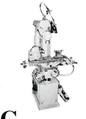

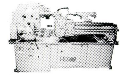

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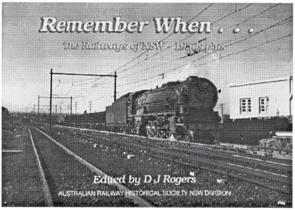
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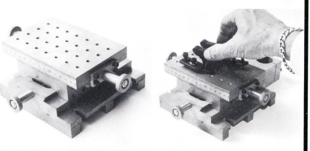

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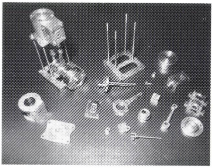

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Gone Troppo

Tropical antics of live steamers at the 39th AALS Convention - Easter 1995

Story and photos by Brian Carter

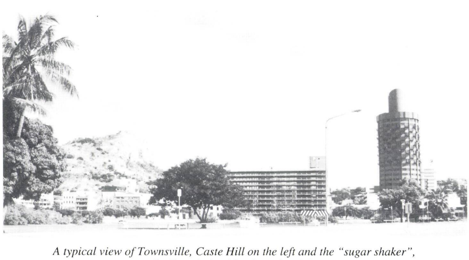
This report is presented in more detail than usual because of the large number of model engineers who could not attend this year due to the long distance involved. Important information arising from the AMBSC and AALS meetings is included. Be sure to read those sections!

For those who accepted the challenge of travelling the enormous distances, the reward was warm friendship and even warmer weather! Townsville, the sunniest city on the Queensland coast, is a perfect location for a live steam convention. And the Townsville and District Society of Model Engineers did a superb job of making the 39th AALS annual convention so memorable!

A big country

270 registered delegates attended: 12 from Western Australia, 5 from South Australia, 38 from Victoria, 61 from New South Wales, 152 from Queensland, 1 from Papua New Guinea and 1 from New Zealand. Readers outside Australia may be interested in a few statistics to comprehend the problems of attending these annual conventions. Townsville is 1450km from Brisbane, 2450km from Sydney, 3350km from Melbourne, 3650km from Adelaide and 5800km from Perth.

Some of the delegates feeling the effects of the sun!
The team from the Lake Macquarie Live Steamers: Ray Cartwright; Anne, Joe and Jeff Huntley; Ray Levoi; Lyn Searant; Bob Taylor and Jeff Wakeham.



A typical view of Townsville, Caste Hill on the left and the "sugar shaker", the Travelodge Motel, on the right.

64 models were registered: two traction engines; two 3½" gauge locos; fourty 5" gauge locos and twenty two 7¼" gauge locos. The furthest travelled was Paul Sherman's narrow gauge *Wombat* class 0-4-0 7¼"g loco from the Castledare Miniature Railway, Perth.

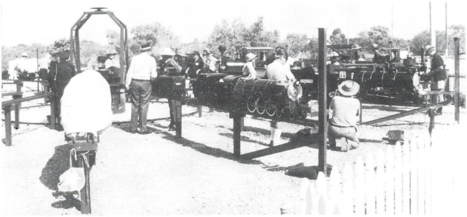
A dream come true

Despite those long distances, the 1995 convention was a resounding success! But not everyone had been convinced it would be. John Wakefield, AALS Vice President, visited Townsville in 1990 from Adelaide, when he was told by Geoff Payne, TDSME President, that they would "have a convention up here in four or five years time". John looked around and said "not while a certain part of his anatomy is pointing to the ground!" Now he is eating his words! John drove his 5" gauge South African 16F Pacific loco many kilometers around the park and thoroughly enjoyed himself.

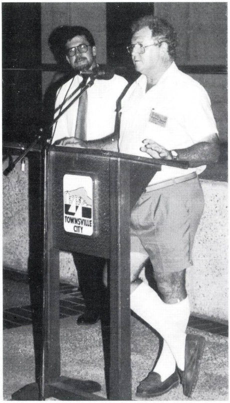
The events leading up to the 1995 convention provide a remarkable story of foresight, pride and support from TDSME members, local businesses and the City of Townsville.

Civic welcome

Some delegates arrived many days before the planned starting date of Friday 14 April. This gave them time to explore the sights and put in some extra running at the track. However, at 7.30pm on the Thursday evening, 13 April, the delegates were welcomed in grand style by the City Council at a reception held in the forecourt of the Council Chambers. Townsville Mayor, Tony Mooney, spoke of the dedication and tenacity of the members of the TDSME, and of the benefits that the host society had for the Townsville community. The City Council was obviously pleased to support the model engineers through providing land, and offering help with finance and practical problems. TDSME President Geoff Payne responded on behalf of the members and thanked the City Council for their support. Barry Glover, AALS President, thanked the Mayor and TDSME President for hosting this year's event.



The roundhouse early Friday morning. The whole area will eventually be covered to protect drivers from the elements. The centre pole on the turntable bridge has a rotating plate to support the canopy centre. The uprights at the end of each turntable road support the outer edges of the canopy.



Geoff Payne, TDSME President, welcomes the delegates. Townsville City Mayor, Tony Mooney is listening patiently in the background.

The Council provided a light supper and drinks while we made new friends and renew acquaintances. Many northern model engineers are unable to travel to the southern convention venues, so there were many new modellers to meet. As a Sydneysider, this was one of the highlights for me, especially when so many of them read AME, or provide articles for your enjoyment.

Good Friday

Friday began with a tour of the loco area to soak up the steam and hot oil — and to partake in the convention ritual of talking about this or that loco, and any other matter of a model engineering nature. In fact, talking is just about the most common form of entertainment — next to driving trains — at any model engineering gathering!

The morning drivers' meeting outlined the park facilities, first aid, meeting locations and tour meeting places, track running procedures, points control, running without signals, car parking and a sun warning! Following a final announcement about an afternoon tour to Townsville's Goninan Locomotive Works, the delegates disbanded and continued with railway operations.

Two delegates had registered 3½" gauge locomotives. The first one on the track was Warwick Allison from the Sydney Live Steam Locomotive Society. Warwick steamed his 4-4-2 *Maisie*. The difficulty was the ground level 3½"g and 5"g portable track that was hastily laid and ballasted as a separate oval. There was no steaming facility, so all work had to be done on the ground, at times on the belly. Warwick had difficulty connecting the tender to the engine because he couldn't reach the pin. At least he had the track to himself once he steamed up! Warwick's children enjoyed themselves steaming Dad's loco around the isolated oval, until superheater problems brought the run to a premature halt.

The other 3½"g loco was Ross Forsyth's *Tich* that Ross steamed on Saturday. *Tich* misbehaved itself at first, but finally succumbed to a little tender treatment and happily hauled Ross and Louise around the track.

A tent was set up to exhibit TDSME members' work in progress. The only project on display on Friday was Geoff Payne's impressive 7¼" gauge Great Northern 2-6-6-2 1906 vintage Mallet locomotive. The original loco, fitted with compound cylinders, was the first Mallet type built, and retained the slide valve technology. Geoff is using Wato cylinder castings as a four cylinder simple engine. The low pressure cylinder has a false outer shell to give the impression of a larger diameter cylinder.

Goninan tour

After lunch, many delegates took advantage of the opportunity to visit a 12 inches-to-the-foot scale workshop: three small bus loads in fact. Bruce Wadsworth, Goninan's Produc-

The delegates sampled true Queensland hospitality at the City Council's reception held in the forecourt of the Council Chambers.

tion Manager, met us at the plant. After a brief introduction we were directed to a meeting room where Bruce outlined Goninan's role in North Queensland. He then showed a short promotional video about the company.

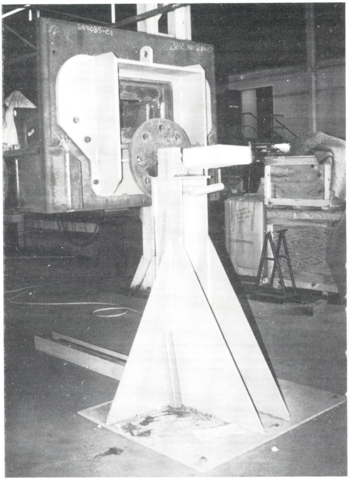
Briefly: the head office at Broadmeadow NSW was established in 1905 when Alfred Goninan came to Australia to set up an engineering business. In 1956 the company was taken over as a subsidiary of Howard Smith. Goninan now has twelve sites around Australia constructing locomotives and passenger rolling stock. Sydney's *Tangara* trains were constructed at the company's Broadmeadow plant.

Ross Forsyth enjoying the 3½"g track for himself!

New QR locos

The Townsville plant was established in January 1994 to construct 40 new 4023 kW (3,000 horsepower) 28 class diesel electric locomotives for Queensland Rail. They have completed the first loco and the production line is set up to complete a locomotive every two weeks. The 28 class loco is the most technically advanced unit to run on QR. Goninan is building the loco under licence from the US-based General Electric.

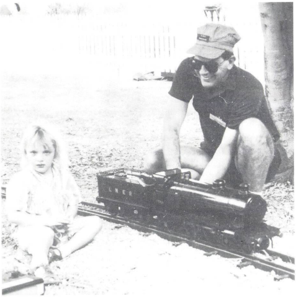
A big challenge was to meet the weight requirements for QR. GE are normally involved in heavy loco construction while Goninan are usually lightweight locomotive constructors. To accommodate the heavy electrical components, Goninan used many tricks when constructing the steel framework. The 116.7 tonne locomotive actually weighed in at two tonnes lighter than expected! Another feature on this locomotive, relatively new to QR, is a driver's cab at both ends of the loco.



There's a prototype for everything!
Goninan's 12"-to-the-foot scale loco rotating stand.

QR wanted a quiet locomotive, so the noise level has been reduced to 87db at 15 metres. You can hold a civilized conversation next to the locomotive while it is idling. The cabs are fitted with air conditioning, toilet and three hand basins. Goninan spent some time with the drivers to ensure that the loco will be comfortable to operate.

The 28 class locomotives are intended for general freight operations from Rockhampton to Cairns and out to Mount Isa.



C'mon Dad, when will it be ready?
*Jennifer Allison patiently waits as father Warwick prepares his 3½."g **Maisie** for a run.*

Number two loco ready for final fit-out and painting. This motley group was the first of three to inspect the locomotive plant.
Our guide, Gary Steen, is second on the right.

The Production Co-ordinator, Gary Steen, acted as our guide for the remainder of the tour while Bruce Wadsworth looked after the second group that had just arrived. Gary was very helpful with his descriptions of modern locomotive construction. All of the delegates present were impressed at the scope of the project. Some were comparing Goninan's processes to those used in the home workshop. The scale was larger but many techniques were similar, right down to the locomotive frame rotating stand! The first loco off the assembly line was out the back in the paintshop receiving the final touch — the crimson lining.

The tour of the loco works was a trip to remember and we were grateful for the opportunity to see the birth of a new class of locomotive.

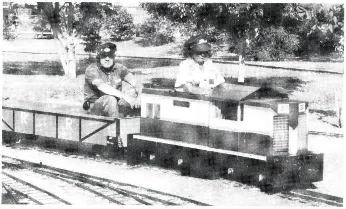
After about an hour of crawling around large narrow gauge locos we said farewell to our host and returned to the convention site.

Back to the convention

The afternoon was spent riding small trains and discussing the finer points of model engineering.

Mike Davern of TDSME spoke to me about the 7¼" gauge version of the Goninan 28 class loco that he is building. Mike already has two locos to his credit: a live steam Heidi and a petrol/hydraulic club loco.

Mike also showed me the riding carriages he made, in particular the braking system he used. While we were at the car shed I noticed that the club has many wagon bogies based on Chas Goodwin's design published in AME issue 37, July 1991.



A visitor driving the Mike Davern built 7¼"g club loco with Laurie Fielder riding as instructor

Ray Schilling drove his Cliff and Bunting traction engine around the park over most of the weekend. The engine performed very well and proved to be a source of admiration from many delegates.

Another traction engine present was David Lance's "Schools" engine. this model won him the AME under 25s Encouragement Award at the 1994 convention. David worked on the engine during the year and fitted a canopy complete with LED lighting. He also repainted and lined the engine. David and his father, Terry, travelled by coach from Sydney to attend the convention.

John and Merv Steadman brought a couple of 7¼" narrow gauge *Heidi* class locos from Altona in Victoria. The pair, H26 and H27, worked long hours as a double-header all weekend. I rarely saw them in the steaming bays!

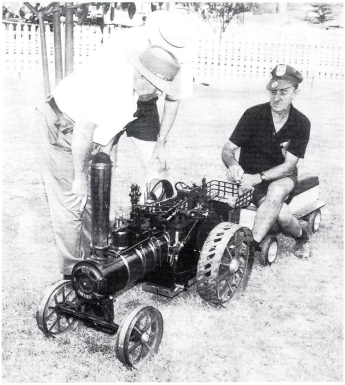
Following the evening meal, the first of the convention "business" meetings began.

AMBSC meeting

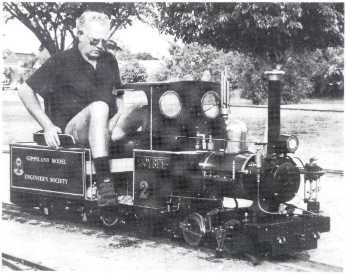
The meeting of delegates accredited to the Australian Miniature Boiler Safety Committee was held on the Friday evening. Business arising from the previous minutes (Easter 1994) provided some interesting discussion.

- With regard to water column gauges, It had been suggested that one standard water level gauge and one column gauge be fitted. After some debate, the meeting voted not to allow water columns as stated in the new steel code clause 5.4.2.
- The $100 levy proved to be a difficult point for many clubs to accept. Less than half of the affiliated clubs had paid at the time of the meeting. To refresh your memory, the levy is a once-off payment from AMBSC member clubs. It will be kept in a special account to be used only when an AMBSC representative has to travel long distances, e.g. interstate by air, to investigate an AMBSC related incident. A situation like this has arisen in the past and the AMBSC representative had to pay the expenses out of his own funds. This is not really fair for a voluntary function — hence the request for a travel fund levy. This was passed by the members at the 1994 convention; but it has resulted in an extremely poor response from member clubs.

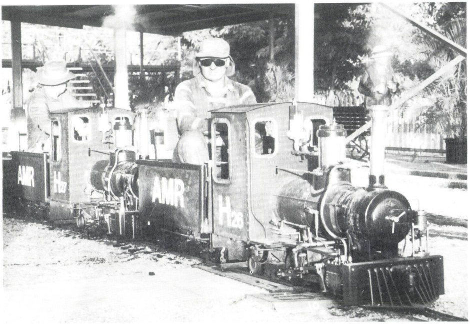
  A motion was moved, seconded and eventually carried that: *all societies which have not paid, or made arrangements to pay, the Travel Fund Levy within two months (8 weeks) from the date of this meeting, shall have their registration with AMBSC rescinded, their Boiler In-*



Hornsby Model Engineers, John Snowden (behind) and Bill Bonser (front), grill Ray Schilling (seated) about the workings of his Cliff and Bunting traction engine.



*Arthur Darrett's 7¼" g **Joybee**. Arthur is from the Gippsland Model Engineers Society.*



A pair of the hardest working engines over the weekend, the Steadman's brought their $7\frac{1}{4}$"g Heidi twins from Altona Miniature Railway in Victoria.

spector's Charter / Recognition to operate as such withdrawn, and, will be required to return their boiler record books to the AMBSC Hon. Secretary.

- Coils in fireboxes of Briggs steel boilers proved to be a hot point for the delegates. After much discussion it was resolved that circulating pipes in Briggs steel boiers shall be mandatory and that clause 3.15.4 will be re-written.

There were a few items of correspondence from various clubs with the following results:

- It was resolved that boiler inspectors' names are to be printed on boiler documents, as well as signatures, for legibility.
- The matter of insurance was raised but is still on-going.
- The future of the AMBSC should be considered. Suggestions from clubs are requested on the matter of dealing with the increased workload now that AMBSC is a regulatory authority. Perhaps a full- or part-time secretary may be employed.
- The suggestion to increase the maximum allowable barrel size and volume of boilers in AMBSC codes part 1 and 2 was defeated — the sizes stated in both codes will remain in force.

An item from general business was worth noting:

- Identification of pieces of a partly built steel boier was discussed. Result: partly built steel boilers should not be accepted without paperwork and history. Boiler inspectors should be very wary in this situation.

After fourteen years on the job, Dave Merrifield signalled his intention to stand down from the position of Hon. Secretary at the 1996 convention. Possible candidates should be nominated by their club or society by 31 December 1995. This will enable candidate information to be published in time for the pre-Easter mail-out. The nomination should include a résumé of the candidate. Ideally someone well known in the hobby, with full-size steam experience and professional mechanical engineering qualifications would be the most suitable person for the job.

Saturday

While surveying the turntable area in the hot sun at 9am, I met Phil Hemer from Papua New Guinea. Apparently there are only about three model engineers in PNG. It must be difficult to be a model builder under such isolated conditions. Next time you are at your club enjoying all the facilities that you generally take for granted, spare a thought for those isolated modellers who can only dream about regular running days!

Official opening

The 39th AALS Convention was officially opened on Saturday afternoon. Geoff Payne welcomed the official guests: Councilor Noel Wilson, representing His Worship the Mayor of Townsville; Peter Phillips, representing the Chief Executive Officer of Queensland Rail's Northern Division; Dan Gleeson, from the Department of Work, Health and Safety; Barry Glover, AALS President; and all other guests.

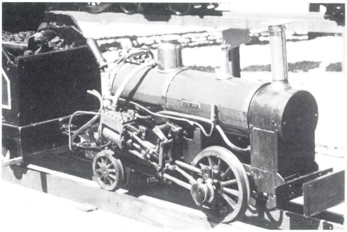
Geoff stated how proud he was of the members of TDSME who had worked so hard to stage the convention.

Barry Glover, during his opening welcome, made special mention of two international travellers to the convention, Phil Hemer from Papua New Guinea and Ken Williams from the Thames Small Gauge Railway in New Zealand.

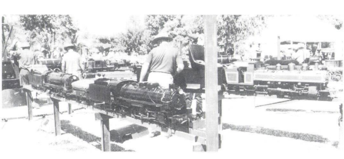
Barry mentioned that, despite representation from all states, there were fewer numbers at this year's convention than usually attend the southern conventions: however, the familiar faces that turn up year after year help to make the conventions a success.

Barry Glover introduced the TDSME's Patron, Councillor Noel Wilson, to officially open the convention.

Councillor Wilson outlined the early history of the council's involvement with the TDSME. He went on to congratulate the Society for its achievements over the last six years. Councillor Wilson welcomed all of the delegates to sunny Townsville, saying that he appreciated the long distances most of the modellers had to travel. He also made reference to the support from the ladies in the society, either helping out at track-side or



An unusual loco, Ken Saunders' ***Rocket*** *had outside Stephenson valve gear on this side and Walschaerts valve gear on the other side!*



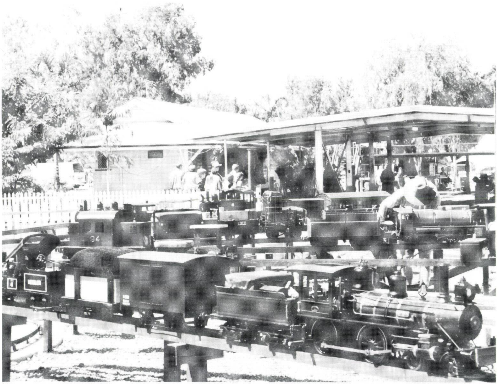
Some 5" gauge locos. L to R: Bryan Harriss' NSW 58 class; Dick Butcher's NSW 59 class; Ron Dubber's ***Dholpur****.*

patiently waiting for their husbands to come home after a day at the club grounds.

A special gift for TDSME

Peter Phillips, of QR, then spoke of his admiration for the TDSME's efforts in transforming the site into the park it is today. The Oonoonba station building was transported to the site only nine months ago! Now it is a fully operational facility. A true example of the dedication and the love of hard work that this club has. Peter also expressed his interest in the live steam locos and the amount of work gone into their manufacture, not to mention getting them to Townsville for the convention.

As a memento of the convention, Peter Phillips presented the TDSME with the ticket stamping imprinter used at the Oonoonba station. The ticket stamper, lovingly restored by Bill Jones, has seen a lot of use. In 1891 there were 710 tickets sold from Oonoonba station, in 1944 there were 25,2840 tickets — due to troop train movements of soldiers travelling to New Guinea. In 1991 only 21 tickets were sold. Many more tickets will be used in the machine as it returns to its former home — the Oonoonba station, now at Railway Park.



Another view of the turntable area. The Oonoonba station and station roof (ex Shell oil drum shed) is in the background. The locos, L to R: Ken Saunders' ***Heisler****; Eric Egan's (I think) diesel outline; Ian Davies'* ***Puffing Billy****; Len Stampton's vertical boilered grasshopper type freelance loco; Laurie Collis' (I think) NSW 36 class and Neil Mackenzie's QR A12 in the foreground.*

When the ticket imprinter was discovered, so was the nipper, a cutting device to convert a full fare ticket to a child's ticket. The nipper was proudly presented to George Whitehouse, the TDSME Station Master. George responded with thanks and a special word of encouragement to the younger generation — which just about covered everyone else there, because he is 88 years old (young)! After George had spoken, Councillor Noel Wilson returned to the microphone to officially declare the convention open.

Geoff Payne then ushered the official party on to the train for a lap of the grounds. Each passenger received a ticket freshly stamped on the imprinter. The train, flagged away by George Whitehouse, was hauled by three 7¼"g narrow gauge locos. The leading engine was driven by Ian Payne, followed by Bruce McGovern and Mike Davern.

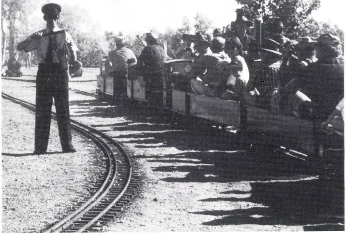
Craft classes

Jude Payne conducted craft classes for anyone interested. At first, participants were a little unsure of what was going to happen. Once word got around about the free classes they had to expand the area to three tables to cater for the 40 ladies who were interested. The husbands weren't the only ones showing off their handiwork over the weekend! It was a well thought out activity for those less "metal oriented".

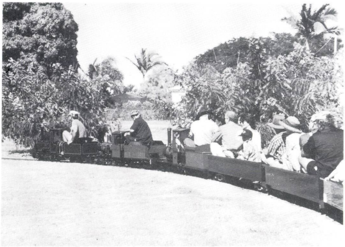
AALS meeting

Saturday evening is the traditional time for the battle of the clubs! There were 21 affiliated club delegates present.

- Several motions were on the agenda for discussion. The first one, a proposal by the Diamond Valley Railway for changes to the AALS constitution was discussed, but was defeated.
- Regarding large versus small locomotives, QSMEE put forward a motion to limit lo-



The official train, flagged away by Station Master George Whitehouse



The triple-headed official train winding its way among the tropical vegetation.

comotive sizes. The Adelaide Miniature Steam Railway put forward a motion to segregate locomotives on dual gauge track. After much debate it was agreed that these restrictions were a matter for individual societies to evaluate their own situation regarding loading gauge clearances and axle loading and to formulate rules and guidelines for their own situation. It will be the individual society's responsibility to inform visitors of any such restrictions.

- The *Safety and Operating Code for Miniature Railways* 1988/93 Manual is to be withdrawn and a new *Code of Practice for the Operation of Miniature Railways, Road Vehicles and Plant* was accepted in principle, with the proviso that the required amendment sheets are included.
- There were five applications for AALS affiliation. They were accepted, bringing the total AALS membership to 60 clubs.
- A ballot for AALS vice-president was necessary this year. John Wakefield was re-elected to the position.

A spokesman for the Penfield Model Engineers Society — hosts for the 1996 Convention — provided an update on preparations for this event. All will be ready in Adelaide in '96.

The 1997 AALS convention was due to be held in Tasmania. Unfortunately no Tasmanian club offered to host the event. There was no representative from Tasmania to discuss the matter, so the 1997 event was left "up for grabs" by the delegates present. After some discussion, Victora was selected as the representative state. The Victorian AALS Branch asked for and was granted a few months to sort out which club would be the host.

Normally at the throttle of locomotives, these model engineers are enjoying a turn at the helm of the Townsville Radio Control Model Boat Club's drive-yourself boats.

Sunday — the ships are in!

Model boating is becoming a very popular pastime these days. It is good to see this side of the hobby represented at the AALS conventions. Last year some brave modellers trusted their pride and joy in a river by the Illawarra Live steamers track at Wollonging.

The Townsville Radio Control Model Boat Club are a lot luckier than their counterparts who went to Wollongong. They arrived at their pond in the park with a splendid display of members' work. I spoke with Neil Chandler, the club President, who explained some of the club activities.

The club has been in operation for about 30 years, but the transient nature of the Townsville population meant that the club had difficulty with growth. Some time ago the club suffered a fate familiar to live steamers when a division occured. The yacht modellers separated from the scale and powerboat modellers.

Over the last four or five years there has been a growth and stability within the scale and powerboat side of the hobby. The club has two operating days a month, one for themselves and one for the public. Their public day fascinated me: they have six radio controlled boats for hire. The charge is 50 cents for about five minutes of sailing time. The rugged little fibreglass hire boats are just the thing to encourage participation by the general public! The funds raised from the hire boats helped pay for the membrane that forms the pond. It's a great idea for those maritime clubs looking to raise some funds for club projects.

The pond

The base of the pond is high density polyethylene sheeting about a one millimeter thick. The pond membrane was installed by a company that specializes in mine tailing dams.

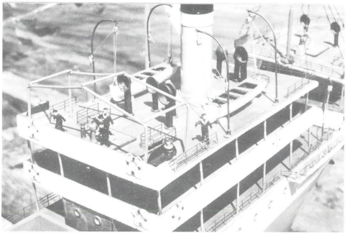
The excavation was carried out using a bulldozer. Problems were encountered with the site being on the old city dump: much rubbish had resurfaced! However, it was soon removed to another site. The pond is 1.2 metres deep in the centre to allow the submarines to submerge.

The membrane has withstood some mild vandalism when some pranksters threw a few Besser blocks into the water. One or two small holes were created but the tough plastic has generally withstood the misstreatment.

There is close to half a million litres of water in the pond — about the volume of eight swimming pools. There is a need for a recirculation system — the green algae grows very fast in North Queensland!

Steam boat

The only steam powered model boat I saw was the *Karatta* now owned by John Keene.



A close view of the upper decks of the steam powered ***Karatta****.*

This steam powered ***Karatta*** *model was built about 80 years ago by John Keene's father.*

It was built about 80 years ago by John's father — before John was born! The full-size *Karatta* was from South Australia and one of the Townsville members was an engineer on the boat at one time. Another convention delegate (I think it was Stan from Victoria) joined the conversation and related a story about his wife's parents meeting for the first time on board the *Karatta*. John was born in Glenelg and remembered the boat operating out of Port Adelade to Kangaroo Island. John has incorporated many improvements on the original design. The steam-bent timber and copper nails remain. However, the large single cylinder engine was replaced with a smaller radio controlled V4 steam engine. The boiler is fired by butane. The outer shell was covered with a modern epoxy coating before re-painting.

Back to the railway

One of the afternoon's activities was a hill climbing competition — someone made a crack about "what hill?" Anyway, the object of the exercise was for each contestant to nominate, on the chalk board, how long it would take them to drive their loco from the start point at the station to a member operating a stop watch on top of the "hill". The driver closest to the nominated time would win. Most of the six contestants had an optimistic opinion of their loco's capacity to achieve their goal! The winner was Gerry Bailey from the Hornsby and District Model Engineers Society. Gerry was 0.7 seconds from his nominated time! He was presented with a pewter mug for his effort. The second prize winner was Brian Day from the same club with 2.5 seconds outside his nominated time. I'm sure the experience of driving for many years on the Galston Valley Railway had sharpened their skills for travelling on any non-level railway right-of-way. The GVR is a 1km run with half of it up a 1 in 80 "hill" with the odd 1 in 60 pinch, and the other half coming back down again!

The legendary "hill climbers" Jerry Bailey with prize cup, and Brian Day riding pillion.

The awards

Sunday evening is the time when the achievers are honoured.

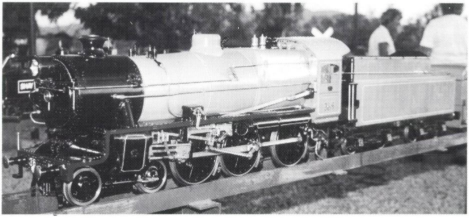
The first mentioned was Dave Mitchell and the local Apex club for a splendid job with the catering for the convention.

The members of the TDSME ladies auxillary also received a special thanks for their valued assistance throughout the event. Alphabetically — Sharon Larson, Kay McGovern, Michelle Mitchell and Jude Payne (my apologies if I missed someone).

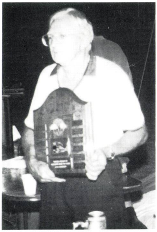
Ken Tinkler from the Live Steam Locomotive Society of Victoria received a special mention for his work in the hobby, particularly with the production of his excellent booklet — *Miniature Live Steam In Australia* — an Australian model engineering society directory.

An award for the hardest working locomotive over the weekend went to John and Merv Steadman for their twin *Heidi* class locomotives *H26* and *H27*. Each received a pewter mug with a couple of cans of XXXX beer.

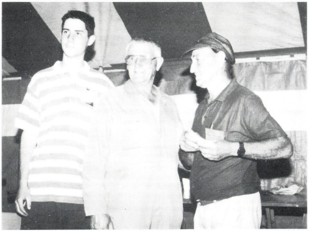
The Sydney Society of Model Engineers trophy for the Most Popular Locomotive at the convention, as voted by the delegates, went to Bruce Willis of the Illawarra Live Steamers for his very very shiny NSW 3619.



The ***most popular locomotive*** *at the convention, as voted by the delegates, went to Bruce Willis of the Illawarra Live Steamers for this very very shiny NSW 3619.*

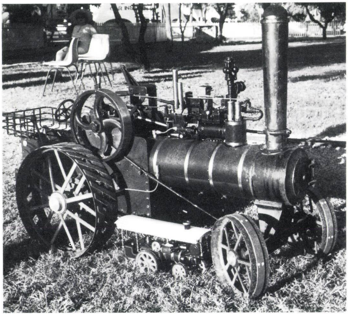


Bruce Willis and his Most Popular Locomotive Award.



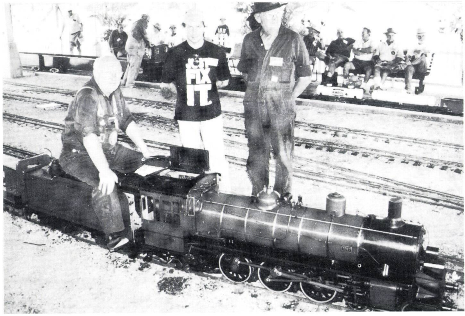
The Tullamarine Live Steam Society trophy for Road Vehicles was presented by Alf Bond (centre) to Ray Schilling (right). An encouragement award was presented to David Lance (left).

Rodney Hague holding his AME Under 25s Encouragement Award.



David Lance's Schools traction engine nestled between the wheels of Ray Schilling's Cliff & Bunting traction engine. Both engines were recipients of a Tullamarine Society award for road vehicles.

Barry Glover (right) presents the Bolton trophy to Joe Huntley for his 3633 — awarded the best Australian locomotive at the convention. Joe's bashful nature didn't last long as took over proceedings with a lengthy and exuberant thank you speech!



The AMBSC team, L to R: Dave Merrifield (Secretary); Ross Forsyth (Technical Representative) and Eric Evans (Chairman). The loco is Eric's 7¼"g QR BB18¼.

Eric Evans, the recipient of the UK Southern Federation Trophy for a a model engineer who has provided outstanding service to the hobby

The Tullamarine Live Steam Society Trophy for Road Vehicles had two contestants this year. The trophy went to Ray Schilling for his Cliff and Bunting traction engine. A special encouragement award (vernier caliper) was presented to David Lance for his much-modified *Schools* traction engine. David won AME's award last year.

The AME under 25s Encouragement award was presented to Rodney Hague for his 5"gauge Krauss steam loco under construction and his operational petrol engine powered NSW X class shunting tractor and train. Rodney was presented with a perpetual trophy to mind for twelve months, a 150mm digital vernier caliper donated by Hare and Forbes (machinery merchants, and long-time advertisers with AME) of Parramatta NSW, a 12-month subscription to AME and a certificate. See the inset for the full story.

The Bolton Trophy for the best Australian locomotive at the convention went to Joe Huntley of the Lake Maquarie Live Steam Locomotive Society for his magnificent super-detailed NSW 3633.

The UK Southern Federation Trophy for a model engineer who has provided outstanding service to the hobby, and has a locomotive at the convention, was awarded to Eric Evans of the Queensland Society of Model and Experimental Engineers.

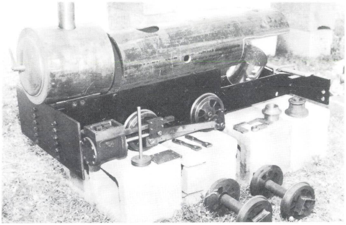
Congratulations to the award and trophy winners!

Don't forget to register your vote for the model engineer you would like to win the UK Southern Federation Trophy for 1996. The person you nominate must have a registered locomotive at the convention. Contact the AALS Secretary, Len Heaton, for further details.

Conclusion

Monday was the time for most of the activity to die down as the delegates headed for home. Some stayed a while longer to taste the hospitality of the northerners and their many tourist destinations. Others carried out a "club crawl" as they worked their way south, visiting the many ME societies on the way. Unfor-

AME's Under 25s Encouragement Award winner



Rodney's 0-4-0 Krauss type live steam loco under construction, with guidance from Laurie Fielder.

I was disappointed with the lack of response to this year's award. It could mean a general lack of interest in the award, or there are very few modellers under 25! The future of our hobby rests with the youth of today. I know they are usually busy studying, dating or trying to make a career for themselves. Don't turn them away. If any young men or women shows an interest in what you are doing, treat them kindly: first impressions count!

There was only one person under 25 at Townsville who was eligible for the award. At first I was going to call it off as a no-contest. Then I was invited to see what this model engineer had produced.

In view of the variety and quantity of work he has carried out, it would have been worse to ignore the achievement of this promising model engineer. Therefore, it was my pleasure to present this year's award to Rodney Hague of the Townsville and District Model Engineers.

Rodney is a 20-year-old, third year fitting and machining apprentice with Australian Meat Holdings. Congratulations Rodney!

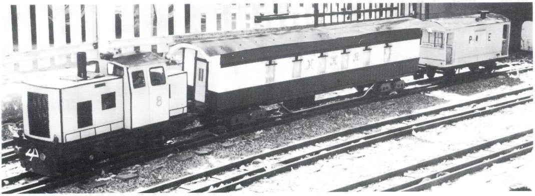
Club support

Being a foundation member of the TDSME, Rodney has seen a lot of growth, both with the club and with his own interests. He has always had a keen interest in railways, starting with HO gauge electric models and gradually drifting — under the guidence of his grandfather — to model engineering.

Rodney's first 5" gauge locomotive project was a petrol engined 0-4-0 NSW X class shunting tractor. Built about four years ago, it took a couple of months to complete with some help from old hands of the hobby. Rodney's first piece of rolling stock was modelled from an HO gauge North Eastern Railway guards van. He has spent the last six months or so constructing a set of three 5" gauge QR vintage coaches — one is now operational.

The latest locomotive project is an 0-4-0 Krauss type live steam loco. This loco, based on Geoff Murdoch's design, is well under way as can be seen from the photograph. Although Rodney made a start on the steel Briggs type boiler, the cost to complete it in Townsville would be excessive. So he ordered a boiler, recently advertised in AME, from Live Steam Supplies of Victoria. The valve gear components are being fabricated from stainless steel. Rodney has decided to add a tender to supplement the small water capacity of the original tank design.

In the spirit of supporting younger members, Laurie Fielder (TDSME Secretary) has been a strong influence — guiding Rodney through the intricacies of live steam locomotive construction.



Rodney's 5"g petrol engined 0-4-0 NSW X class shunting tractor, QR vintage coach and guards van.

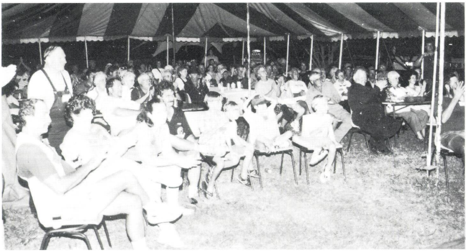
tunately, I had to be back at work on Tuesday, so it was straight home for me.

Congratulations to the TDSME for their organization and hospitality!

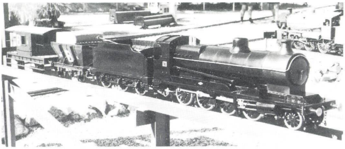
The host for the 1996 AALS National Convention is the Penfield Model Engineers Society Inc., Penfield Avenue, Salisbury, South Australia.

You can plan ahead by contacting:
Hon. Secretary
Penfield Model Engineers Society Inc.
PO Box 792
SALISBURY SA 5108

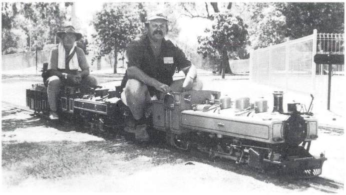
A message from the AALS Victorian Branch indicates that the 1997 AALS Annual Convention will be held at Cobden Victoria. A story of the Cobden Society will appear in the September issue of AME.



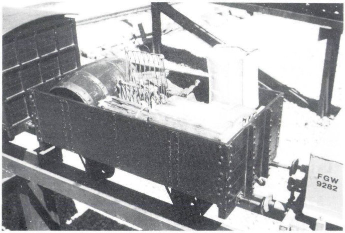
The delegates at the Sunday prize night. I'll leave it up to you to make the identifications.



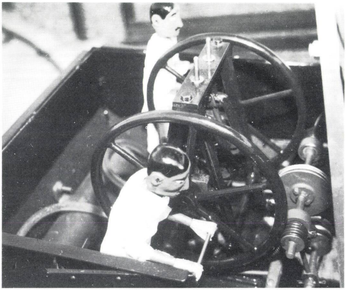
Bob Kimber's ROD loco and typical non-air coal train.



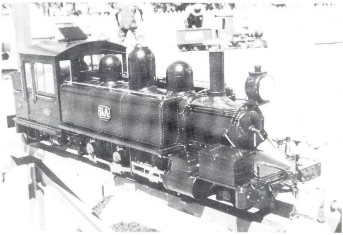
*Roger Anderson (leading engine) and Ron Dubber double-heading their 5"g **Dholpur** locos.*



An interesting load for this QR open wagon by Ken Saunders (I think). The scale guards van on the train contained a tape recorder playing the sounds of hens cackling and other train "load" sounds.



Ingenuity runs rife in model engineers. Ron Dubber's Indian "helpers" pump water from the rear storage tank to the loco side tanks. The drive shaft on the right transmits motion to the handwheels, causing the "helpers" to animate as the train proceeds. This system actually pumps water — just like the real Dholpur!



The beautiful 5"g Puffing Billy NA of Ian Davies.

Please pardon the uncertainty of some of the names.
I put it down to having too much fun!

The Staggering Growth of the Townsville and District Society of Model Engineers

by Brian Carter

A twist to our traditional prototype story. I thought some of the background to the TDSME's formation and rapid growth to stage the 39th AALS convention may offer some inspiration.

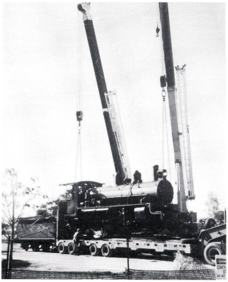
The year — 1989

It all began with a dream, followed by an advertisement in the local paper. "People who are interested in forming a model engineering society in Townsville, please apply...". A month later, with 24 names collected, they met and officially formed the Townsville and District Society of Model Engineers Inc.

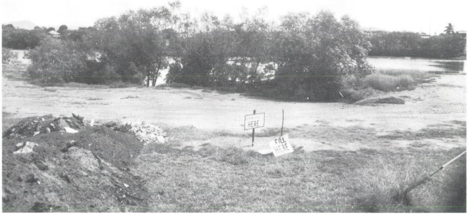
After producing some publicity brochures and canvassing local businesses, the society ventured out on the road to growth. The council offered them a flat parcel of land, on which members used the Mackay Society of Model Engineers' portable tracks for a while. The neighbours offered resistance to permanent residence of the railway, saying that the added noise would be disruptive.

The council then offered the society the present park, which was gratefully accepted. The portable track was set up once more and a small fee of 40 cents a ride gradually built up the funds to carry out the expansions required.

Geoff Payne — the society President, was a subscriber to AME from the beginning, and this was his resource for searching the clubs throughout Australia. From AME he picked out all of the features that he liked, from as many clubs as he could. With all this information the society began to expand. The first thing to do was to accelerate the funding by raising the price of rides to one dollar.

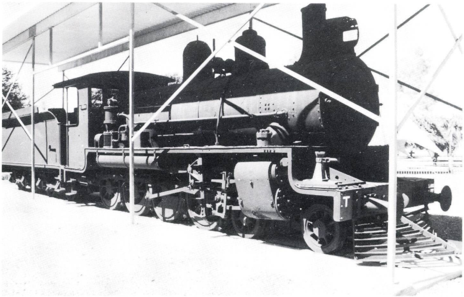


Not every model engineering society has their own real locomotive to play with!
A QR C17 class loco arrives.
Photo: David Edmunds



1989 — Where it all began. The signs are out for "clean fill".
Photo: David Edmunds

The "buildings" arrive, in 1990. Note the trackless roadbed in the foreground.
Photo: David Edmunds



The C17 on show in the park today, nicely protected under cover.
Photo: Brian Carter

Laurie Fielder, the TDSME Secretary, was the sole train driver in the early days, fund raising was good fun but slow. Gradually, however, more trains came "on line".

The park

The location is ideal because the main road runs past the front door! However, the condition of the park left a lot to be desired — it was once a council rubbish dump. In fact it contains the debris from cyclone *Althea* of 1974, the same time as cyclone *Tracey* hit Darwin. All of the rubbish is just 30 to 50 millimetres under the surface!

The park was also covered in guinea grass. Guinea grass of North Queensland grows to about 1.8 metres high! Hand mowers were employed to try and level the park to see where the dirt was. Hand mowers proved no match for the grass so a ride-on mower was purchased to complete the task.

Fill 'er up

With the grass under control, the park needed some levelling and filling. A "clean fill wanted" sign was placed out the front. About a week later there was so much soil there (it seemed about a thousand tonnes!) that they had difficulty moving it with just shovels.

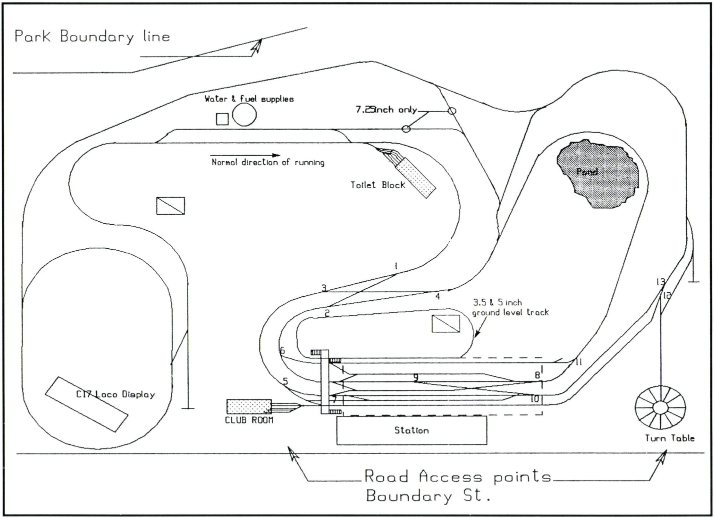
From small beginnings... the general public enjoying a trip on the "mainline", circa 1989. This is the site of the present station complex.

Photo: David Edmunds

Townsville Transport Services were approached about the problem of moving the soil to build a railway. The manager, David Abercrombie, was sympathetic to the cause and sent a grader and a front-end loader to the park. In two days the mound of soil was levelled. This lot just covered a small portion of the total required: it took the best part of two years of moving soil to get anywhere. Once enough of the area was covered, a small oval of portable track was laid to continue public running.

Track layout and construction

With the first part of the track down, two sets of points were added to extend the railway.



A proud moment in the life of any club — the official opening — 28 June 1992
The invited guests look on as the flags are unfurled by: (left) local member of Parliament, Jeff Smith; (centre) Federal member, Peter Lindsay and (right) the Mayor of Townsville, Tony Mooney.

The members of the TDSME on the day of the official opening — June 1992
Photo: David Edmunds

The station trackage awning is in place as the old Oonoonba station building arrives at its new home. A temporary pause on stilts as the foundations are being prepared.

The method of track design was interesting. The layout was produced under instruction from Geoff by Sam Mariott, a draftsman. Once the layout was drawn to scale, the railway was marked off into six metre lengths and every piece of track was numbered — all the way around the park. The easiest way to tackle the project was to treat it like a large geometric snap-together model railway!

All the necessary tools were fabricated for the job: 24 track gauges, about 24 special jig clamps and another 18 clamps for clamping the track pieces to the jig.

A small oval of permanent track was constructed as a club project to enable the railway operations to commence.

The track sections were welded together off-site were the facilities were better suited to the task. 14 to 18 lengths of straight track were welded each day. They were often 10 hour days at the welder! Each track section was numbered to match the plan so that every piece of track that was transferred to the park would fit as intended.

Meanwhile, at the park, the centre lines were pegged out according to the plan. Because there were no trees, marking out straight off the drawing was easy. Being a snap-together type railway has its advantages. After the pegging-out, many trees were planted on the barren ground, giving them time to grow and develop as much as possible before the railway was finished.

Welding fever

All the pieces of the track were ready to assemble at the park. Neil Tweedale and Geoff Payne took a couple of weeks to bed down 1000 metres of track! Initially the track was laid without the wooden sleepers in place: they were added later. Another member, Aub, made regular appearances at the park to shovel ballast on the track. Many other members assisted.

Growth in patronage

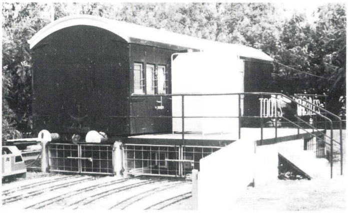
Once the 1000 metres was laid, the club boomed. The public turned up in droves, instead of making the usual $40 a day, the takings multiplied 70 times — $2800!

After looking through more back issues of AME, it was found that one club offered a $2 ride all day and a $7 family limit. After presenting the idea to the TDSME members, the club decided to adopt the new fare structure.

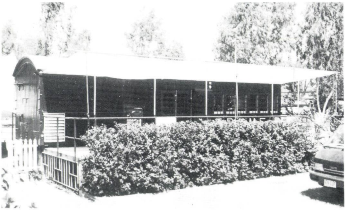
Now it was on! The finances became sound for future growth and development. The track work was continued to include the inner loop. From there it became a matter of improving the versatility of the railway with more points and crossings, more sidings, etc.

New structures

Laurie Fielder heard of an old drum shed at Shell that was going to be pulled down. Laurie approached Shell for the shed to be donated to the club, which was duly granted. Sam Mariott drew the steel fixing drawings for the ex drum shed to be expanded into a large station canopy. Phil Edmunds, a boiler-



The amenities block — fully equipped toilets and showers.
Photo: Brian Carter



The "club car" acting as a meeting room and archive centre.
Photo: Brian Carter

maker, modified the old drum shed into the new station roof structure.

Everywhere they go, TDSME members ask for discounts. Lysaghts gave the club a discount on new roofing sheets — it doesn't hurt to ask!

Another member heard about some pipe being reprocessed because of its imperial dimensions. After approaching the company concerned, the club was 1800 metres of pipe, plus fittings, better off! The club brought in a trench digger and hey-presto, a complete underground water system was in place.

At that time Queensland Rail had put up the old Oonoonba railway station building for sale by tender. Members measured the station for compatibility with the available space at the park. After realizing that the station fitted the space, Northern House Relocators were approached for some idea of the cost to move it to the park. The company offered to do the job for half the normal commercial rates.

Then the club set about writing letters to Queensland Railways, the Premier's Department,and anyone else they could think of. The result was that the railway donated the old station building to the club! A more detailed description is in AME issue 54, May-June 1994, page 22.

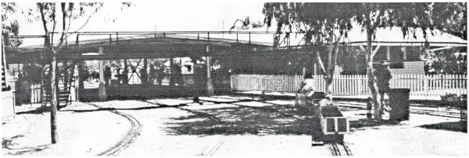
Queensland's Asset Services offered to refurbish the historic building — if the club supplied material. Because of the historic nature of the structure, the Council offered financial assistance towards the restoration.

A casual trip past the Townsville Casino one day provided another opportunity too good to pass. Some workmen were removing the paving bricks so that a concrete apron could be laid instead. After negotiating with the company concerned, the pavers were eventually delivered to the railway park.

Many more improvements had been carried out to prepare the grounds for the AALS Convention.

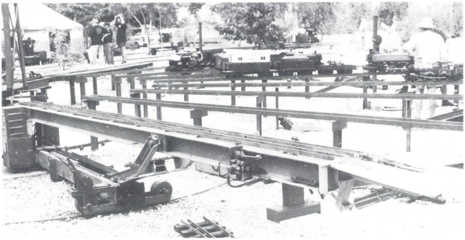
Now that the convention is over, the club can now relax and enjoy the fruits of its labour.

What was that you said was on offer...?



The old Oonoonba station complex is now fully operational.
Photo: Brian Carter

The public's first view of the TDSME railway park, as they enter the grounds through the old station building.
Photo: Brian Carter



The hydraulically powered, fully adjustable turntable approach track. The end apron was added straight after they saw the article in AME March-April 1995 issue!
Photo: Brian Carter

Clock Making for the Amateur

By Roy Skyring

Introduction and photos by Dave Harper

I first met Roy Skyring at the QSMEE Trophy Day a couple of years ago. I was stunned by the workmanship in Roy's clocks and asked him then if he would produce an article for AME. He promptly agreed.

I was able to get round to Roy's lovely home and be given the grand tour — every wall and table seems to have a clock on it. There is a magnificent display case in the lounge room with row upon row of different examples of the clock maker's art. Roy told me he started making clocks in 1982, and has been making about two per year ever since!

Roy would like to contact other clock makers, or anyone interested in starting! Contact him via me or the editor....
Dave Harper.

At the recent Clock and Watch Collectors' Convention in Sydney, one of the sections attracting great attention was the display of clocks made by amateurs. The attention to detail and workmanship were both incredibly good, and many reproductions of famous English and European clocks were represented. Some very ingenious originals, were also there indicating that modern craftmanship, far from being a lost art, is alive and well.

I hope these people's great efforts will encourage others to enter the field and rebuff the cry one hears so often that "they couldn't make anything like that today". "They" can and "they" do: unfortunately to a limited degree, but to the great satisfaction of the maker in creating an item that will outlast most others in this throw-away age.

As a maker of clocks, I exhort people not actually involved in mechanical trades not to be discouraged into thinking that such a hobby is beyond them.

My own background is that I came from a mechanically inclined family but somehow became sidetracked and finished up as a science teacher. I was employed for four years as an instrument maker in the RAAF, during which time I was involved in watchmaking, an interest which I have maintained to the present day. Clock making is a logical consequence.

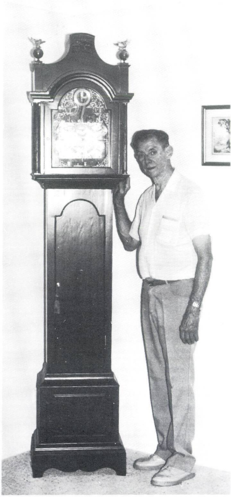


***Photo 1** Roy beside his magnificent Claude Reeve musical long case or grandfather clock. This has a total of 15 tuned bells giving three chimes and a a choice of three tunes. Roy is about six feet tall, which shows the size of the case!*

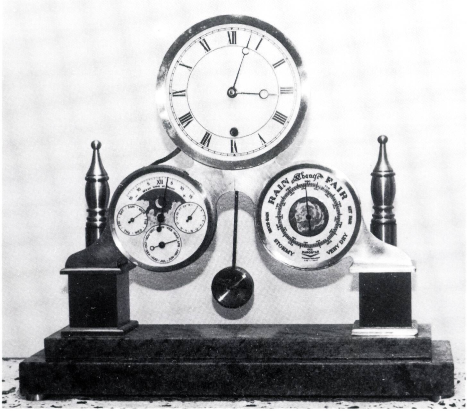


***Photo 2** is a French design, with a normal clock on top, which also drives the lower left dial showing day, date, month, phase of moon and equation of time! The lower right unit is a barometer. The whole set-up is mounted on a marble base about 15 inches long.*

It would be idle to suggest that such an undertaking is possible without adequate gear, but people involved in model and hobby work, who are already turning out planes, trains, boats and engines can confidently undertake clock making.

No elaborate set-ups are required, as witness one of England's most proficient amateur clock makers who took out trophies year after year at the *Model Engineer* exhibition with original and complex clocks. Claude Reeve, a dental mechanic by occupation, worked in a space about the size of the average "smallest room in the house".

For turning arbors, pivots, etc., a small lathe is required. A drilling machine, various hand tools (files, taps and dies in the 2 to 8BA range, etc.) and the ability to be reasonably proficient at metal work are also needed. To be endowed with a measure of patience and persistence is also useful.

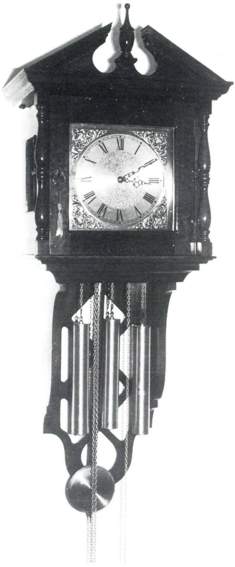


Photo 3 *is a beautiful chiming wall clock.*

Material Supplies

- Engraving brass, brass rod and tube etc:
  George Weston,
  Kurilpa St, West End, Qld.
  In other states, check the Yellow Pages under Brass or Non-ferrous Supplies.
- Silver steel rod for arbors etc, also taps, dies screws etc, can be obtained from most suppliers advertising in AME.
- The John Wilding books are available from Hobby Mechanics.
- Clock Hands, dials, glasses, springs etc:
  About Time,
  65 Union St., Nth. Sydney;
  Austwide Watch Services,
  6th Fl, Coles Bldg, Brisbane;
  Anregis,
  6th Floor, 160 Edward St.,
  Brisbane;
  C. Timms,
  6 Coulo Cres., Ferny Hills, Qld.
  Check Yellow Pages under Clock Manufacturers and Wholesalers elsewhere.
- Wheel and pinion cutting:
  Clockcraft,
  11 Prince St., Urangan, NSW.
- Clock case plans:
  U-Build Enterprises,
  PO Box 132, Rose Bay, Sydney;
  Harry Beaman,
  Clock Movement Importers,
  1 Medora St, Durack, Qld.

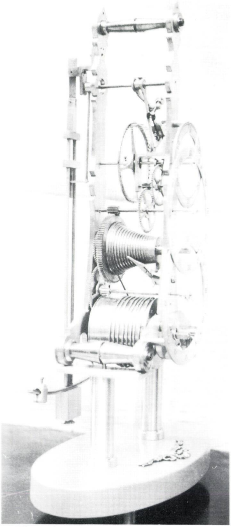


Photo 4 *is one of Roy's recent projects, a pin-wheel escapement skeleton clock. It has separate dials for the second, minute and hour hands, driven from the pin-wheel escapement which gives one-second steps through its "coup perdu" or dead-beat action from a half-second pendulum. The pendulum has a bi-metal strip which gives automatic temperature compensation.*

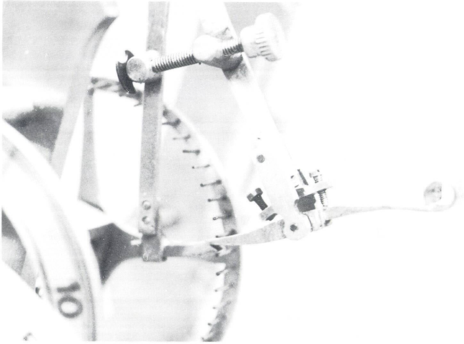


Photo 5 *is a close-up of the pin-wheel escapment.*

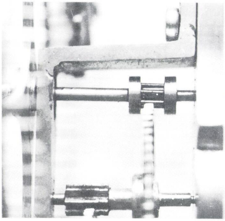
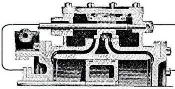


Photo 6 *is a tiny lantern pinion mounted on the arbor carrying the escapement and the second hand and just visible in photo 4. The lantern pinion was used as it proved impossible to make a standard brass pinion small enough..*

Continued on page 28...



Steam Chest

with Dave Harper

Welcome to another Steam Chest! I've had some very interesting feed-back on a query in the Nov-Dec 94 AME about the reason for the bent tube and funnel in the engine room of ST *Forceful*, see the picture reproduced again below.

Firstly, Roger Jowitt of Applecross, WA, sent me a succinct explanation. The "gooseneck and funnel" on the condenser air-pump is for a very good reason. As the pump is always trying to create a vacuum in the condenser, it must exhaust somewhere, and that's what the vertical pipe and gooseneck is for.

However, sometimes — as past experience has dramatically told me — the air pump will carry over water if the condenser is allowed to become too full of condensate due to any malfunction in the boiler feed system, hot well tank drain, etc. The water is then dumped down the funnel into the bilges.

Roger went on to tell me he looks after a couple of portable steam engines and a 7¼"g steam railway at the Cohuna Koala Park in Kelmscott, WA in his spare time. He would be happy to swap experiences with any other steam buffs! Thanks for that Roger, and for your kind comments on AME.

In the same mail came a very interesting article from Mark Grimshaw of South Australia, which I'll reproduce in full.

Hot well overflows

"The bent-over pipe in the photo of Forceful's engine room is the overflow from the hot well tank in the feed water system. The pipe with the funnel on it is to catch the fresh water the feed pumps can't handle and put it back into the storage tanks.

Like most things in engineering it has an interesting history. In the days when marine engines worked at 30psi or less, jet condensers were used to create a vacuum on the exhaust side of the pistons to increase the power of the engines and to recycle some of the vast amount of latent heat in the exhaust steam back into the boilers to help out with the coal bills.

The jet condenser consisted of a closed vessel into which the exhaust steam was discharged. It then met a spray of cold water taken from whatever the ship was floating in. This condensed the exhaust steam quite well, but didn't produce pure condensate: it made a warm solution of salt diluted with a bit of fresh water.

This mixture, together with the air released from the injection water and that from the boilers in the steam, was pumped from the condenser by the air pump to be discharged into the hot well tank from where the feed pumps drew the feed water — at a rate considerably slower than it was being supplied.

This left an on-going surplus to be disposed of, so a pipe was taken from the hot well through the side of the ship above the water line.

Crews and passengers in-the-know would lower buckets over the side on ropes and get some of this warm water to wash decks, clothes or themselves.

The invention of the surface condenser, bringing about the segregation of the coolant and the condensate, caused a great reduction in the amount of water to be removed from the condenser by the air pump. Indeed, it was often less than the demands of the boiler feed through the gland leakage from the engine, safety valve lifting etc., so that "make-up" water had to be put into the system.

Many of the early surface condensing systems still had the spray and piping so that jet condensing could be reverted to in the event of the circulating pump breaking down, or it could be used for a short time now and then to add the make-up water, the salt going into the boilers not being great enough to cause too much strife with their insides.

Until the metallurgical and tube-fastening problems were solved, leakage was a frequent problem with surface condensers so oversupply of water to the hot well stayed as a frequent condition, and the overboard discharge often did a useful job as before.

A good example of one of these each-way-bet condensing systems is the Hall Russell compound engine for the SS *St Rognvald*, shown in the book *Elementary Manual on Steam and the Steam Engine*, mentioned in AME May-June 1994.

As experience grew with surface condensing and the advantages of genuinely clean boilers were felt, and provision of fresh water tanks and/or evaporators eliminated the salt from the make-up, the only way salt could enter the system was through condenser leakage, and badly maintained tube packings.

With these new conditions, therefore, water flowing out of the hot well overflow was a sign of trouble rather than a normal condition. So it became practicable and desirable to draw the attention of the engine-room crew to it.

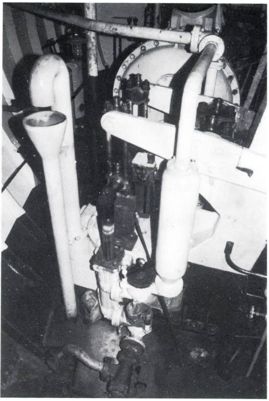
This was done by eliminating the overboard discharge from the hot well and taking it upward to provide enough head of water to help the feed flow through the feed pump inlet valves, then turning it over so the overflow would go down the bilge and be seen.

This symptom could also indicate feed pump failure, feed filter blockage or flooding of the condenser through a prolonged stop or at starting on an engine with the air and feed pumps driven by levers from the crosshead, with auxiliaries still exhausting into the condenser.

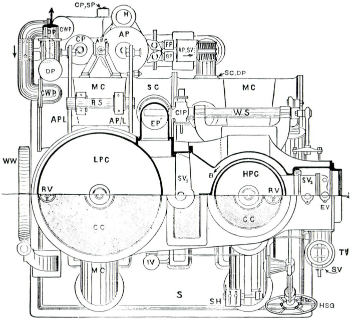
The *John Oxley*, the *Yelta* and the *Wattle* are some still existing examples of ships with hot well overflows discharging to the bilge.

The next obvious improvement is to catch the fresh water that comes out the overflow from time to time. Justification for this seems to depend on the preference of the owners and the distance the craft will work away from a fresh water supply, versus the cost and complication of the extra piping and the suitable tanks, i.e. below the level of the pipe outlet.

Through all this it must be remembered that the amount of water the condenser will hold isn't that great compared to the amount in the boiler or the peak tanks. The other way of coping with this glut of water in the condenser before starting the main engine and wasting it is to have a suction line from the condenser bottom to the Weir independent feed pump so the water can be pumped into the boilers. The *Yelta* has this set-up."



*ST **Forceful**'s condenser pump with the pipe and funnel under question.*



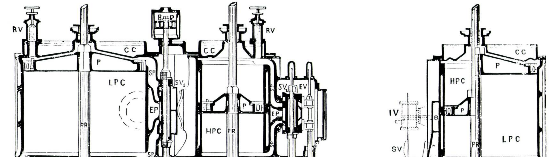
PLAN

Index to Parts.

H P C	for	High-pressure Cyl.
L P C	,,	Low-pressure Cyl.
C C	,,	Cylinder covers.
R V	,,	Relief valves.
S P	,,	Steam ports.
E P	,,	Exhaust ports.
P	,,	Pistons.
P R	,,	Piston rods.
S V₁	,,	Slide valve L.P.C.
S V₂	,,	Slide valve H.P.C.
E V	,,	Expansion valve.
V S	,,	Valve spindles.
B P	,,	Balance piston.
S V	,,	Stop valve.
T V	,,	Throttle valve.
C	,,	Crosshead.
C R	,,	Connecting rods.
L M	,,	Link motion.
E R	,,	Eccentric rods.
E	,,	Eccentrics.
H S G	,,	Hand and steam starting gear.

S S G	for	Steam starting gear.
W S	,,	Wyper shaft.
E V G	,,	Expansion valve gear.
E V E	,,	Expansion valve eccentric.
S H	,,	Starting handles.
S	,,	Sole plate.
M C	,,	Main columns.
E P′	,,	Exhaust pipe.
S C	,,	Surface condenser.
F	,,	Flooring.
C S	,,	Crank shaft.
C S B	,,	Crank-shaft bearings.
A P	,,	Air pump.
H	,,	Hot well.

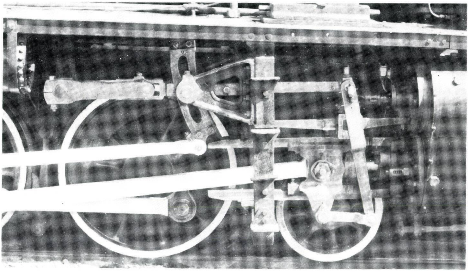
A P L	for	Air-pump levers.
R S	,,	Rocking shaft.
A P R	,,	Air-pump rod.
A P G	,,	Air-pump rod guide.
P B	,,	Air-pump bucket.
F P, B P	,,	Feed and bilge pumps.
C P	,,	Circulating pump.
C P S P	,,	Circulating suction pipe.
C W P	,,	Circulating water pipe.
D P	,,	Discharge pipe.
C I P	,,	Common injection pipe.
G	,,	Gauges, steam, vacuum, and receiver.
W W	,,	Worm wheel for turning gear.



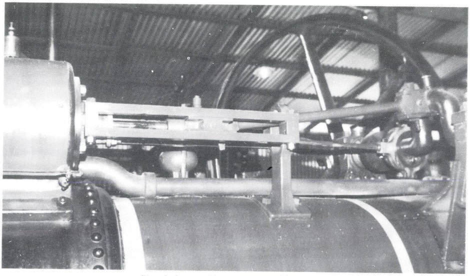
FRONT ELEVATION

SIDE ELEVATION

SS *ST ROGNVALD'S* ENGINE



The crosshead on Queensland Rail C17.



Simple bar guides on a portable engine.

St Rognvald's engines

St Rognvald was a steamer that plied the stormy seas around the Scottish islands and was state-of-the-art in 1906.

The dimensions of her compound engine were 36" and 70" bore by 48" stroke. Professor Jamieson uses this engine as an example over several chapters in his book, and includes many excellent diagrams.

If any readers would like copies of the chapters referring to the engines, about 80 pages, I could be persuaded to supply them for the cost of copying and mailing.

A guide to crossheads Part Three

I have a confession to make! The illustration used in the last issue showing Stephenson's Killingworth locomotive was a bit premature. At the small size as printed in the book, it appears to have round bar guides, but when I studied an enlarged photocopy it was clear that they were in fact two flat bars with the crosshead between!

Now, as the engraving was presumably done by an artist rather than an engineer, there may be some doubts as to its accuracy. The length and size of the guides would seem altogether too flimsy for flat bars, but possible for round ones. Does anyone have any further proof?

Anyway, crossheads running between two flat bars are certainly common enough, as the two photos clearly show. The portable engine is, I believe, a Ruston Hornsby from circa 1900, while the loco is a QGR C17 seen at the Gympie Gold Mine Museum.

Actually, the loco appears to have T section guides with the crosshead slotted to fit. This is a logical development, as it gives lateral as well as vertical guidance.

Another engine familiar to readers is the steam winch in the Queensland Steam and Vintage Machinery Society's museum at Petrie. I don't have a photo which clearly shows the crossheads, as they are hidden under the main winding drums. However, having stripped, cleaned and reassembled them, I can assure you that they are simple steel bars about 1½" x ¾" bolted to the main casting. The crossheads are cast bronze, and lubrication is pretty much hit-or-miss with the oil can!

Next time we'll have a look at trunk guides. Until then, happy steaming!

Clock Making... Continued from page 25

From casual enquiries it seems that most people seem to be put off by the idea of cutting gear wheels and pinions which make up the entire "going part" of a clock. Actually it is probably the simplest part of the whole exercise.

Clocks employ the cycloidal tooth form. Such gears run with lower frictional losses than the involute gears found in car gearboxes, etc. Wheel tooth sizes are expressed in the module system. There is no point in going deeply into this at the present stage except to say that for a first clock what is known as "0.6 module" is a good size to use.

Commercially made cutters are available from material suppliers: by using them you can be assured your tooth profiles will be correct. There are firms which make and supply wheels and pinions to order.

It is a personal choice for the constructor to decide the type of clock he or she prefers. A timepiece, with one gear train and telling time only (no chime or strike), is the obvious choice for a first attempt.

Skeleton type clocks are very popular. They usually have a fancy frame and are housed under a dome or in a transparent case to expose all the working parts to view. Some very impressive examples of fine workmanship are seen.

Wall clocks, bracket clocks, mantle clocks and long case (grandfather) clocks all require wooden cases, so the maker will need to be able to handle the woodwork side of the project.

A large range of published designs is available for clock cases. U-Build in Sydney can supply an excellent catalogue of plans, Clock Movement Importers at Durack, Qld, sell plans and all manner of bits and pieces like mouldings, pendulums, dials and so on.

Englishman John Wilding has written a whole series of "How-to-make" books covering every conceivable type of clock from a simple weight driven wall clock to some incredibly complex ones usually only seen in museums. These books are clearly written and well illustrated with numerous drawings and photographs. A list of available titles includes: *Construction of*: a Crystal Wheel skeleton clock, a Large Wheel skeleton clock, an English dial clock, an English Regulator, a weight driven tower clock movement and a weight driven brass alarm clock.

The *How To Make* series covers the Congreve clock, a 16th century style clock, skeleton clock, weight driven eight-day wall clock and a scissors clock. There should be sufficient scope there for everybody.

If you're really stuck for supplies or information, drop a line to Roy via AME!...ed

A Locomotive Rotating Stand

Story and photos by Peter Dawes

Drawings for publication by Ken Gifford

I think a rotating stand is a necessity, not a luxury, and especially if you own a detailed locomotive. You may need to work on your loco with it oriented upside down or on its side. A rotating stand makes drilling *in situ* easy and safe, and it vastly simplifies assembly and disassembly. The dimensions given are for a 5" gauge NSWGR C36 class loco about one metre long.

Before starting construction, be sure that the drill press table is square to the drill in both axes to within 2 degrees. Weld all joints clamped to a sturdy piece of angle iron so they do not warp. Especially important is the joining of the top cross member to the frame legs so that the rotation axes are square to the legs at both ends.

All frame members are 1½" x 1" x 16 gauge RHS. 1½" x ¾" x 16 gauge would also be okay.

Key dimensions are as follows:

1. The rotation axis height - normally at buffer or coupler pocket height on the loco and the height on the stand is equal to approximately half the distance between your navel and your nipple height for a 5" standard gauge loco. For high narrow gauge prototypes I suggest going one inch lower for every inch it exceeds 13 inches high over the buffers. But don't subtract it if the height is only due to a particularly long chimney.

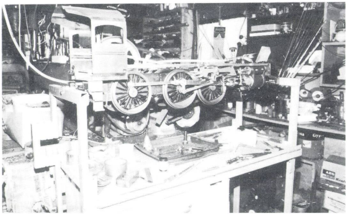
2. The distance of the shelf below the axis. This should be ½" to 1" more than the distance from the buffer line to the highest point of the loco, normally the chimney or dome.

3. The length of the stand between inner faces of the main upper cross members that carry the axis. This length is equal to the length of the loco outside the buffer beams, plus about 1¾". Less is preferable to more since the extra space must be filled with washers and only increases the twisting stress on the buffer beams. This additional length provides the space for the bolting brackets. The rear bolting bracket is a 1½" by ⅜" bar, the same length as the drag beam. The front bracket is a disc 8" diameter by 3⁄16" thick which bolts to the buffer beam and becomes an index plate for rotating the loco around its long axis.

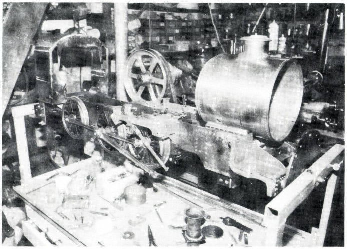
Any residual axial play must be taken up by washers and spacers or the index pin will push the loco away from the front end support.

Note that if your loco has buffers they should be removed to mount the loco in the frame. To leave them there would add too much stress to the whole mounting. Besides, you will almost certainly need to make use of the buffer stock mounting holes as other suitable holes will probably not be available.

4. Swing radius. If there is an overhanging cab roof as there is in the C36 you must add the square "notch" in one of the legs as shown in the diagrams. This will be on either one of the legs at the rear end of the loco. It allows the overhang to swing clear of the legs of the stand when turning the loco upside down. The critical dimensions here are two: the maximum and the minimum radii encompassing the overhang. These determine how far down the leg the notch must start and finish.



This view of the stand shows the "notch" at the left-hand end.



The stand in use. Note the index plate on the right-hand side.

We use a notch in the leg rather than a boss in the centre of the cross-member to stand it off because there is much less strain on the cross-member when it carries the weight directly over its centre. A boss to extend the axis bearing 3" inside of the cross member would put unacceptable twisting stress on it. The notch can easily be made very strong.

Note that to construct the notch you start by making this leg the same as the others. Then you cut the three extra pieces of the same RHS stock and clamp and weld them to the outside of the leg at the appropriate height. The centre pieces are cut at an angle as in the drawing (about 40 degrees in my case). You can find this angle and position by scribing a chalk line on the frame with the main axis as centre and the two required radii, as determined above.

This construction creates a square hole on the outside of the leg. Then just cut the piece out of the original leg to leave the notch. Do not try to make it with the leg already cut in two.

If there is no overhang beyond the inside limit of the frame members, you do not need this special notch. If the overhang is less than say, ½", then just increase the length of the frame enough to accommodate it.

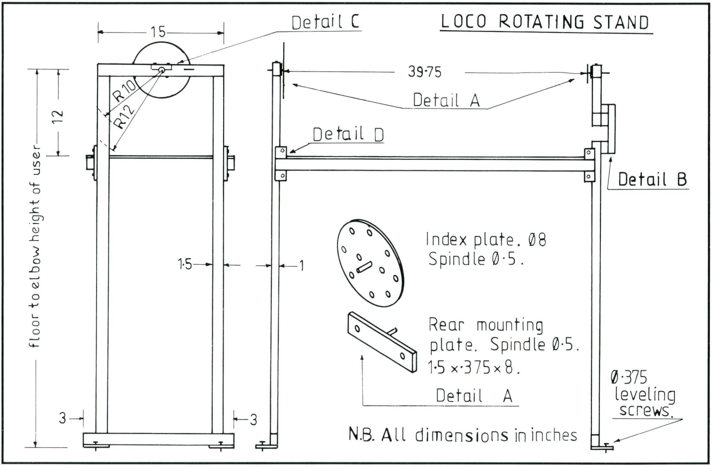
In any case, the notch only needs to be on one of the legs. Please yourself which leg you choose. If on a front leg, the loco is turned upside down by rotating it forwards. If on the back leg, you rotate it backwards. In my case there were space considerations in the workshop that made it necessary to put it in the left back leg.

The shelf

The stand sports a very necessary and important shelf to catch small parts that drop, and to hold tools. This shelf can be ¼" thick hardboard. It should have a 1" lip of wood or angle all round to stop things rolling off.

Below the shelf there is a space about 29" high by 39" wide that you can use in any of four ways:

- It can be left empty, or
- a small cabinet can be placed under it to hold tools and stocks of nuts and bolts and boiler fittings, or
- you can put a small stool under it, or



- you can add another shelf. If you adopt this option, this shelf should be ¾" particle board with a piece of 1½" x 1½" x ⅛" angle underneath the centre to stiffen it. It is supported by simple 2"x1" pieces of wood or 1"x1" steel angle or RHS at each end, bolted across the end frames.

The bolting faces of the main longitudinal stays

These require special comment. Make the two longitudinal stays that support the shelf and link the end frames by drilling the bolting holes (¼") while they are clamped together back to back. Note that the holes on these stays are 3" apart so that when you assemble the frame with ¾" x ¼" hex bolts in ¼" holes, and when they are tightened fully, the frame needs no additional bracing. This is an important advantage because it leaves the bottom space free of other cross pieces. Always ensure that you leave an adequate (5" or more) kick space at the bottom front. One of the four legs can have an adjusting screw (⅜") through its foot to set the stand stable on an uneven floor.

The index plate

The indexing plate also requires some extra comment. It is about 8" diameter; but if you cannot swing 8" in your lathe make it the maximum size you can handle. In any case it should not be less than 6". Score a circle to drill the eight index holes (No.8) and if you can index eight places (at 45 degree intervals) do this too while it is in the lathe. Mark an extra pair of holes on a diameter for the bolts to go through the buffer mounting holes.

Note: On the C36 these buffer holes are 6" apart and 7/16" in diameter, but since we only use ¼" bolts we need small bushes to centre the bolts in the holes. Use 5/16" or ⅜" bolts for big thick buffer beams on heavier locos. With the C36 I found that two ¼" studs were the best way to mount the index plate to the buffer beam. I tapped the two mounting holes in the index plate ¼"BSW and made a stud 1½" long. I used a tapped spacer to lock the stud in the plate. This way, the extra stud length sticks out the back of the beam where there is spare room and where a nut can be put. If the head was at the back, the bolt would have to be cut to exact length because it cannot project far beyond the outside of the index plate.

The index pin itself is a ¼"BSW x 2" thumbscrew tapped into the back end of the right-hand cross member at the exact distance to match the radius of the scribed circle of index holes. (I chose to put the front end of my loco in the frame to the right-hand side, which makes rotating it a right handed operation). The end of the pin should be gently rounded and tapered to about a 15 degree included angle so the small end is just smaller than the holes in the index plate (No.8 is 0.199" or 5.1mm).

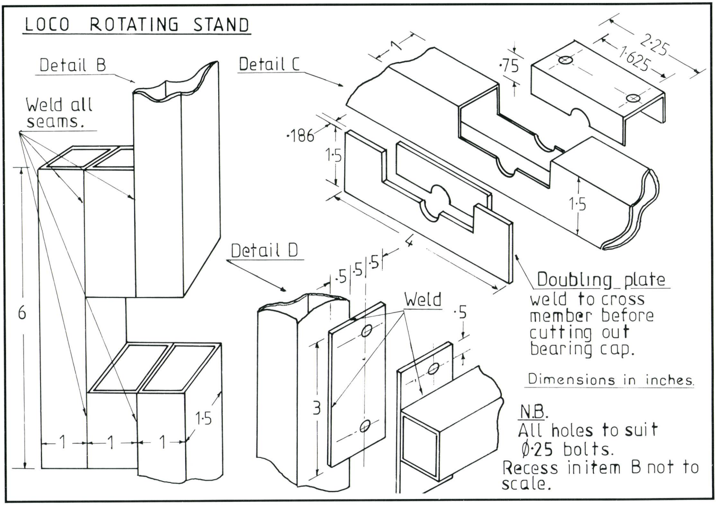
You may also need spacers *behind* the buffer beam under the nut if there are structures sticking out there. The C36 has two beam stays on each side that necessitate a ½" long spacer at the back as well as one at the front. All spacers should be made as wide as there is space to accommodate them because this gives added strength to the whole mounting.

Use ½" x 2" bolts as axis pins. Turn the heads down to about 3/16" thick and square the inner faces carefully. Weld them to the bars using the heads to hold them square. There is no need to turn the face of the index disc as long as it is reasonably flat and smooth since the index pin has extra length to find the hole. Lightly countersink the index holes.

The main axis bearings

It is a good idea to make the main axis bearings in the top cross members before they are welded up because it is then much easier to work on them.

The axis bearing in the cross members is made by first cutting a pair of 4" x 1½" x 3/16" straps. Scribe the centre lines on both axes of one piece. Scribe lines from the longer centre line to what will be the top edge, 1⅛" each side of the centre. This will make a split bearing cap 2¼" long nominal. Clamp the straps together. Drill a ½" hole in the centre and two small holes (say ⅛") located 1 1/16" from the centre with their centres in what will be the *top* half of the bearing. These holes are only to form the fillet for the corners of the bottom halves.



Now hacksaw along the longitudinal centre line, leaving the line in the *bottom* half, to meet the small holes. Doing this now is just a little easier than later. Weld each piece along all edges to what will become the *inner* face of the centre of a top cross-member. Drill two holes in each cross member vertically at a distance of ¾" from the centre line to form the holes that will bolt the two halves of the bearing together later (with 2"x¼" bolts). Drill the ½" hole right through the member using the hole in the plate as a template. Hacksaw through the parts to complete the horizontal cuts and cut down from the top face along the vertical lines to meet the small holes. This allows the top piece to be removed to form a bearing cap.

Alternative method

There is an alternative construction for the axis mechanism: to make the two axis pins the non-rotating components, fixing them *firmly* in the frame. Put the bearing holes in the rear bracket and in the index plate respectively. (In this case there should be a short bush in the index plate to increase its bearing surface area.)

In some ways this is a more robust construction because it brings the suspension points closer to the buffer beams, reducing overhang and hence the leverage on the beams. However, the catch is that at least one pin has to be removable in order to get the loco into the frame in the first place, and the loco weight must *not* be put on to the pins until they are firmly and *rigidly* fixed in the frame. This makes loading and unloading the loco a minimum of a two-man operation.

In the first method the brackets are just bolted to the buffer beams on the bench. Then the whole assembly can be lifted and dropped into place onto the bottom halves of the bearings in the rotating stand — a one-man operation at the beginning. The caps of the axis pin bearings are not even critically necessary.

So the second method makes insertion of the loco into the frame a more difficult procedure — but it may be better for really heavy locos, such as narrow gauge prototypes where it will be at least a two-man operation in any case. I chose the first method but I concede that the other does have its advantages.

When you have no buffers

On the C36 the drag beam has no buffers, so you have to find somewhere on the beam to drill equivalent holes at exact buffer height and at some equal distance from the centre line. I drilled mine 4⁹⁄₁₆" apart, which puts them close to the drag box for extra support. I tapped these holes ⁵⁄₁₆" BSW and so was able to use bolts without nuts to hold the mounting bracket to the beam. The holes are left there as they are not visible.

You must use short, wide spacers (1" suggested) about ³⁄₁₆" long as necessary, drilled through to suit the bolt diameter, to space the beam away from the bracket at the rear, and from the index plate at the front if relevant. Always finish all the work on the two beams before mounting the loco in the frame because they are not accessible for drilling or working once in the frame and because the beams *must* be securely fastened to the frames to carry the weight of the loco without imposing severe twisting stress.

Finishing off

Give the stand a coat of combined rust stabiliser and primer such as Ironize® and finish with a coat of suitable enamel. Remember that the stand is likely to be around for a number of years, so you might as well make it presentable. The stand becomes useful as soon as you have completed the frames, bolted on the buffer beams, added a few stretchers, and riveted in the horns.

From then on you will be seeing a lot of your stand, I guarantee you'il find it extraordinarily useful!

Have a look at a full-size locomotive rotating stand on page 11 of this issue... bmc

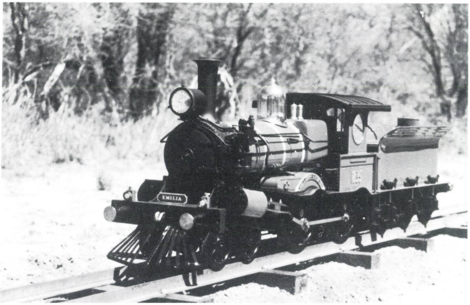
Building a NSWGR Z12 Class 4-4-0

And a track to run it on in Outback Queensland

by Jim Bryan

This is not so much a story about the nuts and bolts of construction, but more about the people in our wonderful hobby, a hobby of helpers. In this case the helpers' net extended from Queensland to Southern NSW to help get Jim's 5-inch gauge locomotive on the track.

After purchasing an AME, — the first one printed after its revival, I spent the next few hours writing to each of our limited suppliers of castings and plans for their respective catalogues. The field was narrowed down to E & J Winter's Z12 as I liked the vintage lines of locomotive. The order and cheque were dispatched forthwith and the waiting started for the arrival of my locomotive "kit".



Jim Bryan's NSWGR Z12 class loco ready for a run through the mulga.

Now what?

I will never forget the total feeling of stupidity, isolation and ignorance that I felt on the day the castings and plans arrived for the Z12. Where was the instruction booklet? The how-to-do-it manual? Not to be put off, I rang Ernie Winter and suggested, quite politely, that he might have inadvertently left it out. No, there was not a booklet and it was not left out, but he could suggest a couple of suitable publications which might help. As Spike Milligan always says when confronted with a similar situation, "What are we gonna do now?" Well, what I did was to mention to a chap down the road (who was building an aeroplane) that he was not as mad as I, as I was building a 5" steam locomotive.

What luck! He knew Bob Kimber (Sooty) from Maryborough and he would not mind me ringing him. I still don't know whether he minded, but in Bob I found a kind, considerate and ever helpful friend who steered me through the construction of the Z12 by phone. My home of Barcaldine is 1000 km from Maryborough. Telecom probably bought a new Landcruiser out of the profits of my phone calls, but it was all worth it.

First tentative steps

Well, I made a start on the front bogie (pilot truck) springs. At this stage I had never used a metal lathe before and didn't have a clue as to what did what, so after much reading of the Myford manual I tackled the axles, boxes and frames. Suddenly I had a four-wheel bogie that I could push back and forth. This spurred me on to complete the rest. Thank God I never read Martin Evans' book *Manual of Model Steam Locomotive Construction* at that stage or I probably would have thrown the whole lot in a box out of sight! Instead I read a book by Tim Coles, a wonderful light-hearted book on the construction of miniature locomotives. So with Tim's attitude under my wing I got stuck into the locomotive, all the time discovering such things as number drills, ME threads, BA threads, tapping-size drills and — wonder of wonders — how to read a vernier calliper and a micrometer kindly given to me by my father. He had (as I found out later) the utmost confidence in my ability to perform the task of building a locomotive: like "I was his son"!

After 12 months had elapsed — which seemed to fly — the main running gear was operational and ready for the air test. Another phone call to Bob and I set the timing and was warned about losing fingers etc. when it started to turn.

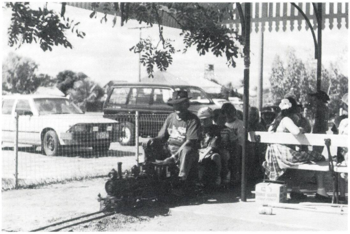
Air before steam

The air was hooked up and the chassis balanced on two milk tins and, wonder of wonders, it went! It is only now that I realise why, but all that mattered then was that it went. The boiler was the next part made and a long trip to Maryborough (combined with their Spring Carnival) was made for plate inspection and part assembly. Back home I made the finishing touches to the boiler. The pressure test came much later as the next trip to Maryborough was some time off. So I tackled the tender with great gusto, thinking that I would have it done in a few weeks. Several months later it emerged, looking very handsome indeed with its flared top and umpteen rivets in the sides. The boiler test now completed and no faults found, I entered the world of pipes, valves and taps. Bob very generously gave me an old copy of LBSC's *Live Steam Book* which I did not totally appreciated at the time of giving for the wealth of knowledge inside its covers: now it is one of the books in my library that is never lent. The locomotive was now nearing completion and then by a stroke of luck Gerardus Mol saw a photograph of my tender in the MELSA magazine and wrote to me with lots of detail photographs of the restoration of 1210. These were a great help and enabled me to add fine details to my loco not before known, such as the timber and canvas roof, the marker lamps, headlight, and the Westinghouse pump. The late Walter Shellshear of Canberra also sent photos and encouragement. Finally the day arrived to paint the loco. I had etch-primed it all, but baulked at painting it as my knowledge of painting is as limited as my knowledge of flying a space shuttle. I really wanted it to be ready for the 1993 Spring Carnival in Maryborough, so I engaged the services of our local spray painter and panel beater, Darryl O'Dell. He did a superb job and went to a great deal of trouble to get the right colour green for it. Finally I etched the maker's plate on brass for 1235, affixed them and stood back.

The finished job

Two-and-a-half years of spare time, worry, happiness, frustration and now pure pleasure! She truly was a pretty sight! I sat around for a week gloating over my achievement and then decided that maybe I ought to give it a run before going to Maryborough. Fortunately, Bob Kimber had given me a drive of his Midland Single on my first trip to Maryborough so I had some idea what would work what. I made up some track out of 25mm x 10mm flat steel with wooden sleepers and lit a fire in her. To this day the actual raising of steam has greater appeal to me than the actual driving of steam locomotives, as they slowly come to life as the temperature rises until the safety

Activity around the Barcaldine steaming bay



Neil Mackenzie takes on passengers at the station

valves blowing off herald the time to move. Truly a wonderful experience.

Anyway, with Dad as an audience, 1235 moved off under her own steam. I walked beside it as I had forgotten to build a driving car in all the excitement! Maybe I thought I was going to stand in the cab. I did a lot of dreaming in those 2½ years, all about parts working and steam valves but nothing about neat and tidy lawns and gardens; thank God the grass doesn't grow much in winter! So she was cleaned up, polished, oiled and packed ready for the trip to Maryborough for the Spring Carnival.

Hot fire and warm friends

The first "light up" with an audience of experienced builders was one of the most nerve-racking times of my life, with comments like "Is it hot yet?" etc. But the warmth of the fire was nowhere as strong as the warmth of friendships and feeling of belonging to a very special group of individuals who have achieved the construction of a working steam engine. But there was worse to come. I won the Doug & Mary Kuske Locomotive Trophy for the best finished Locomotive entered that year. This reduced me to tears of joy. I headed back home in a bewildered state of joy, which took several months to get over. Fortunately I recovered and with the help of photos from Gerardus was able to build a bogie water gin to ride on with eight-wheel braking. Beats walking beside it!

The helpers

My special thanks go to Bob Kimber for his patience, understanding, letters and sketches. To Ernie Winter for his follow-up interest in my project and the excellent service provided by way of advice, nuts, bolts, rivets and all the necessary gear to build working models. To Neil McKenzie for all the advice and encouragement he provided, even though at times the advice was so far above my head that I could not see it; and to Gerardus Mol and Walter Shellshear for their photographic assistance and encouragement.

Local drawings are great!

I have now started my second locomotive, a *Super Claud* in 5" gauge. For anybody who criticises Ernie Winters' drawings, take a cue from me, they are the best I've seen. Their detail leaves the *Claud* drawings far behind. I would suggest that anybody contemplating the construction of a steam locomotive or traction engine, should put some research into the full-size original as it is well worth the effort: you then end up with a model of something that you and others can relate to. Ron Prestons' book *From Tender to Tank* told me a lot about 1235, where the loco ran and the loads it pulled. Maybe somewhere in NSW there is still an old engine driver who actually drove her!

Laying a Track

After building the NSWGR Z-12 class loco, Jim decided a seven-hour car trip to steam his loco was just too far. By now the bug had well and truly bitten and thoughts turned to track laying closer to home .

As all locomotive owners know, they can't go anywhere without tracks. So the brain was put into gear and the following ideas surfaced.

- A track on my property.
- A track in a park uptown in the main street.
- A track at the Australian Workers Heritage Centre.

Idea 1. I knocked this on the head myself. The complexity of insurance, the public using our home etc. was more than my wife could handle.

Ideas 2 and 3. They were knocked on the head by a greater power than me.

The other option was to commute to Rockhampton (a seven-hour drive) to the nearest track on their running days: not a great alternative. Enter the Barcaldine & District Historical Society. Yes, they would like a track in their grounds.

"Will you address a meeting?"

"By all means!"

The idea was proposed and the okay given. Engaging the enthusiasm and help of two other people, we set about our task.

"When will it open?"

"9th and 10th April".

"Will it be finished?"

"Of course!".

Our first fund raiser uptown one Saturday morning raised $500 — not bad for a little town of 1200 people. So with such an encouraging start I lobbied a steel company, Union Steel, and the Emerald Saw Mill and before long we had 70 x 6 metre lengths of 25mm x 10mm flat bar and enough timber to cut 1300 sleepers. The plan was streamlined and the Council was successfully lobbied for road base and rollers. All help was given with the utmost cheerfulness.

As most model railway track-builders are aware, there is a very limited amount of ready information to draw on for the construction details. So we just used a bit of common sense and after eight fairly hard weekends of work, 177 metres of track was built with steaming bays for four locomotives, a turntable, railway station and three sets of points. Three level crossings suitable for people in wheelchairs were also provided.

The support from Brisbane, Maryborough and Rockhampton members for our opening was something that had to be seen to be believed and my thoughts went back to the day in Queens Park at Maryborough when my 1235 had her first run. The Longreach Town Band came down, a round trip of 200 kilometres to play on the Sunday.

The kids had a ball, but they will need some stern tuition on how to ride miniature wagons. The parents commented on what a wonderful form of family entertainment it all was.

And so it was: the opening of the first 5-inch gauge miniature railway track in Queensland west of Rockhampton. We extend cordial invitation to all tourist and steam people heading out this way for a look at the west. You are welcome to call in, and if you are there for the last Sunday of the month, share a running day with us. Feel free to ring me on (076) 51 1780 and have a look and a chat if it interests you.

Lastly, if I can assist anybody anywhere in the field of miniature engineering and track building, I would be very glad to share my limited knowledge. This truly is a hobby of helpers!

Speed Control of Model Engines

by Frank Stagg

There is a general rule in the design of dynamic machines such as pumps, turbines and engines that speed is inversely proportional to size when operating at the same pressure.

An excellent example of this very simple relationship is found in hydro-electric engineering, where a 5000kw water turbine design may be based directly on tests on a 50kw model. Thus, a turbine model having a runner diameter of 0.4 metre and a speed of 1000 rev/min at best efficiency point would have an operating speed of 100 rev/min when scaled up to 4 metres diameter and operating on the same head.

Scale speed

For steam engines, the relationship between size and speed is not as precise but may still be used as a guide. It would be splendid to be able to film a steam engine model in operation, project that at several times life size on a screen and have the result look like the full-size machine.

If a model is true to scale in all respects, then any component may be used for speed scaling purposes. It could be for example the flywheel diameter, piston diameter or the throw of a crank. Assume then that a steam engine model with a 0.1 metre diameter flywheel has been based on a full sized machine having a 2 metre diameter flywheel running at 200 rev/min. The scale is thus 1:20 and the model operating speed should be 20 times 200 or 4000 rev/min. At 4000 rev/min connecting rods, cross-heads and cranks would be just a blur. Reducing the model speed so that it looks more realistic is the main source of difficulty in making a governor for a model that works.

Governors

With some minor exceptions a governor has two essential parts:

- The speed sensing element, known as the pendulum, which consists of springs and rotating weights.
- The actuator which does the actual work of moving control valves. Although the internal forces in a pendulum may be quite high, any external load on it should change the radius at which the pendulum weights run at a given speed.

Where the external force is small and fairly constant in one direction, or changes in a systematic manner, satisfactory speed control can be achieved with a simple pendulum governor. Examples of this are the hit and miss governor for a gas engine, fuel rack for a diesel engine, and deflector governing of small Pelton water turbines.

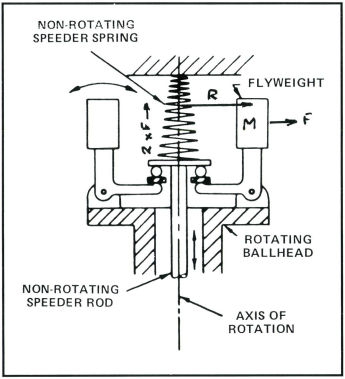


Figure 1

When the pendulum is used to move a regulating valve which has friction then the friction force, by natural perversity, will always act in a direction opposite to that in which the pendulum weights are trying to move. The result is that a small change in load may cause violent changes in speed or even loss of control.

Governor pendulum forces — basics

For the reader not used to working in radians per second, just a few words of explanation. It is a measure of angular velocity in the same way as revolutions per minute but the numbers are different.

To get from rev/min to ω (omega) it has to be remembered that one revolution is 2 x π (pi) radians and that there are sixty seconds in a minute, thus multiply rev/min by 2 x 3.14 and divide by 60. That is, multiply by 0.105.

One or two simple calculations showing why the governing of small models is such a problem may also point the way to a solution. A very elementary pendulum is shown in Figure 1, in which the centrifugal forces of rotating weights are balanced by springs. The use of the word "weights" instead of "masses" is how they would be referred to in a parts list.

The centrifugal force of rotating mass is given by

$$F = M \times \omega^2 \times R \qquad \text{equation (1)}$$

where F is the centrifugal force in Newtons, M the mass in kilograms, ω the angular velocity in radians per second, R the radius of rotation in metres.

Say we put some numbers into equation (1) for a pendulum with a 5kg flyweight running at 0.1 metre radius at 200 rev/min (this is no model!). Then

$$F = 5 \times (200 \times \frac{6.28}{60})^2 \times 0.1$$

so

$F = 219$ Newtons.

Few of us have any instinctive "feel" for the Newton as a unit of force but we can relate it to something with which we are familiar. The force of gravity on a 1kg mass is 9.81 (say 10) Newtons, so 219 Newtons is about 21.9kg.

Now make a one-tenth scale model of the above pendulum but keep the speed the same at 200 rev/min. Lengths go down to 1⁄10, areas to 1⁄100 and volume (hence mass) to 1⁄1000.

So

$M = 0.005$ kg

$R = 0.01$m

then

$$F = 0.005 \times (200 \times \frac{6.28}{60})^2 \times 0.01$$

$F = 0.0219$ Newtons.

Going through the same ritual as before, 0.0219 Newtons is about the weight of 0.00219kg or 2.19 grams. To get this into perspective, two sheets of paper and an envelope are 20 grams. Thus 0.0219 Newtons is a very small force. However, in the above calculation we only took the mass of one flyweight, in fact there are two so we should double the force to 0.0438 Newtons.

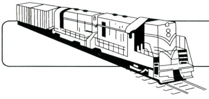
The problem

There are two conflicting requirements for model realism: the model should run at the same speed as the full-size machine but engineering design would say that speed should be inversely proportional to size.

The compromise would be to run the model at the same low speed as the prototype but to scale up the governor speed. This would mean that the crankshaft speed could remain the same as before but the governor pendulum speed increased ten times for a one-tenth scale model.

That is, for our assumed model, the pendulum speed would be increased to 10 x 200 = 2000. The equation for the pendulum shows that the centrifugal force is proportional to the square of the speed, so that by increasing the pendulum speed from 200 to 2000 rev/min the force would be increased by a factor of 100.

Continued on page 36 ...



Club Roundup

Coming Events

12 August
AALS Vic Branch - meeting
Invitation run at Gisborne Victoria

12, 13 August
3rd Annual Blowfly rally - Mudgee
Bring your Blowfly, or anything else, to Mudgee! Contact John Oliver Ph:(068) 43 2557 (business hrs) or (068) 45 2018 (after hrs)

26 August
AALS Interclub run - West Ryde
The Sydney Society of Live Steamers invites all clubs to their track from 8am to 10pm. Contact the Secretary for details: PO Box 124, West Ryde, 2114.

30 September to 2 October
Invitation run - Port Augusta SA
At the Port Augusta Model Engineers track, Homestead Park, Elsie St. Enquiries phone Ernie Riding (086) 42 3858

13, 14, 15 October
Annual steam fest - Galston NSW
The HDMES invites all model engineers to their annual steam fest. Friday is club only, Saturday and Sunday open to the public.

21, 22 October
7th Australian Traction Engine Rally
The Inverell Pioneer Village, NSW, is the venue for this year's national miniature traction engine rally. Contact: Bob White (067) 22 1569 or Gordon Blake, (067) 22 4272.

21, 22, 23 October
Open weekend - NZ
An open invitation to an open weekend at the New Plymouth Society of Model Engineers.

21, 22 October
AALS Vic Branch - meeting
Interclub run at Euroa Vic. plus regular public run on Sunday.

28, 29 October
New complex opening - DVR Vic.
The Diamond Valley Railway invites everyone to the official opening of their new complex. Also the 34th anniversary of public running. An interstate 7¼"g "corroboree" is also planned.

4, 5 November
Invitation run - Wagga Wagga
See display ad for details.

5 to 10 January 1996
Steam Expo 96 - New Zealand
Otago Model Engineering Society. Contact the Convener, PO Box 2163 Dunedin 9030 New Zealand.

Wellington NZ

Maidstone club members are impressed with the operations of other clubs, citing the activities of the Paraparaumu, a small club obviously operating with great success, their latest project being the provision of a traction engine drawn trolley for public rides. An informal meeting on 9 March was preceded by the running of locomotives for a short time. Favourable weather conditions on public run days in recent times, has led to good attendances by the public.

The Paraparaumu club, at a recent monthly meeting, hosted George Dent as their guest speaker. George worked in the Hutt Railway workshops for many years, and his reminiscences were most interesting.

At the Hutt Valley club meeting in March, several members described their piston ring manufacturing methods, and others outlined their methods of paining models.

Paraparumu Associated Modellers Inc.
Maidstone Model Engineering Society Inc.
Hutt Valley Model Engineering Society Inc.
Location: Marine Parade, Petone, New Zealand

Narara NSW

The amenities building project is about to get underway, with stage one of construction due to commence on approval from Gosford City Council. The underfloor area of the new building will provide much needed storage space for the increasing fleet of 7¼" gauge rolling stock. A welcome addition to the club's stable of locomotives arrived recently, a 7¼" 0-4-2 *Forney* locomotive from Melbourne by Little Graham. Club stalwart, Mick Farrell, recently retired from the NSW railways after 42 years of service. Members wish him happiness and good health in his retirement, and no doubt enjoyment, working on his pet projects at the club track. The first operational day of the year on 7 January was a great success, after threatening weather cleared during the morning. Patronage was excellent and 29 members operated 10 locomotives to move the traffic. Work continues on the club site, with preparations under way for trackbed extensions, general track maintenance, and fabrication of new 5" trackwork and installation.

Central Coast Steam Model Co-op Ltd.
Location: Lot 10, Showgrounds Road, Narara. NSW
Public Running Days: 1st Saturday of each month.

Wollongong NSW

The new carriage shed is now complete, making the job of stowing equipment much easier. The canteen extensions are well under way, resulting in smoother operations for the Ladies on run days. The club recently hosted a visit by Kevin and Glynnis Wadley from the Wodonga (Vic) Club, who were holidaying in the area. They came away impressed with the track and facilities. The installation of new trackwork is proceeding satisfactorily. Five new members have recently been admitted, with current membership at 79, and six honorary members. Members had been busy for some time preparing for the Queen's Birthday June open weekend. A call went out for rolling stock, in order that freight train working could be carried out. Other activities over the weekend are to include competitive events such as nominated time laps, braking tests and shunting competitions.

Illawarra Live Steamers Co-op Ltd.
Location: Stuart Park, Virginia Street, Wollongong
Public Running Day: 4th Sunday of each month

Galston NSW

Work recently completed at Galston includes provision of fire fighting facilities, signals location map, clubroom electrical installations updated, and a stone retaining wall near the signalbox. Much work is in progress — six new passenger cars are under construction, work continues on the traction engine track, and two farm engines have been mounted on a display plinth. Work also continues on the ground level turntable, and completion of the double deck carriage shed. Safety projects in hand include provision of a convex mirror in the cutting behind the clubroom, and widening of cuttings for increased track clearance. Quite a few new members have been recently admitted to the club.

Hornsby and District Model Engineers Society Co-op Ltd.
Location: 9 Mid Dural Road, Galston NSW
Public Running Days: 2nd Sunday of each month

Prospect SA

As from the 1 April 1995, a certificate of competency will be required to be held by all persons carrying out the duties of locomotive driver, guard, station attendant and signalman. These certificates are required under Occupational Health and Safety regulations, and a code of practice for these regulations was discussed by the AALS executive at an Albury, NSW, meeting attended by local member John Wakefield.

The club recently learned that another large model Tasmanian K class Garratt locomotive has been built in Argentina to run on a 500mm gauge line in Tierra Del Fuego, at the southern tip of Argentine. The other large model operates at the Bush Mill Railway at Port Arthur, Tasmania. The line also operates a 2-6-2T and three coaches built by an English firm.

The Adelaide Miniature Steam Railway Society Inc.
Location: 370 Regency Road, Prospect. SA
Public Running Day: 4th Sunday of each month

Gisborne Vic

Many working bees were held prior to the May 21st Rally in order to complete the toilet block, landscaping and completion of the engineering workshop museum. A souvenir ticket was produced for issue to passengers patronising the miniature railways. The club was well represented by many members, 17 engines and associated equipment, at the 5th National Rally held in March at the Canberra Exhibition centre, hosted by the Canberra and District Historic Engine Club Inc. two engines bequeathed to the club by the late Jack Fogarty, have become the responsibility of Jim Stewart, and one of these, the Wishart 2HP was taken to Canberra. The club is presently endeavouring to locate a suitable headlight for the 2 foot gauge Perry locomotive.

Gisborne and District Steam and Engine Society Inc.
Location: Webb Crescent, Gisborne, Vic.
Public Running Day: 1st Sunday of each month

Moorabbin Vic

The club has a new president, Ken Rofe, who has taken over "the throttle" from Ken Tinkler, with Graeme Tinkler remaining as Secretary for the next year. The small gauge revival weekend has come and gone and was deemed a great success, with at one stage nine 3½" gauge locomotives being noted running on the elevated track. The display tent proved a bonus, providing an area for 0 and 1 gauge steam models, a steam boiler static display, and a trade stand.

Many club members and their wives attended the Tullamarine Inter-club run on 11 February 1995, held in ideal weather conditions. 32 locomotives were in attendance, 7 being from Moorabbin.

Steam Locomotive Society of Victoria Inc.
Location: 128 Rowans Road, Moorabbin
Public Running Day: 1st Sunday of each month except January

San Francisco USA

Work continues on extensions to the ground level track, labour and weather permitting. Plans are in hand for repairs to the main bridge and a new crossover, together with a removable span in the high track over the roundhouse access spur. Applications have been received from three prospective new members. The recent silent Durkee auction drew satisfactory bids, some bids being from Australia. Some GGLS members who also have an interest in IC engines, tractors and aircraft, have recently learned of the new "Bay Area Engine Modellers" club which has been formed by persons interested in building, buying and running model IC engines. These members model miniature steam engines, old tractors, multicylinder IC engines, hit and miss engines, and radial engines, with 70 models already constructed by 45 members.

Golden Gate Live Steamers Inc.
Location: Loma Cantadas & Grizzly Peak Boulevard, Tilden Park, Berkely, California.

Club Roundup contributions

AME is pleased to receive club newsletters for consideration in this section. Newsletters are often a good source of articles, which we appreciate all the more, but most of all they help us keep in touch.

It is often difficult to decide what to publish and what to leave out, and the task of selecting material for a wider audience takes a lot of time. Also, there is always the risk that AME will publish something that the club considers sensitive. Please help by sending a "press release" page with your newsletter, or highlight the items you think we could use. We'll give first preference to clubs that help us out this way.

bmc

Speed control, continued from page 34

Thus the force for two pendulum flyweights would go up from 0.0438 to 4.38 Newtons (about the weight of 0.438 kilograms or 438 grams).

Governor sensitivity

The calculations above could give the impression of quite a substantial force available for operating a steam valve. However, what has been calculated is a centrifugal force which is balanced by a governor spring. The pendulum spins around but does nothing useful. The function of the pendulum is to move a control valve in response to a load change.

Now assume that we have the same pendulum as above, that is two flyweights each 0.005 kg running at 2000 rev/min under steady full load conditions at a radius of 0.01 metre. The centrifugal force of 4.38 Newtons is balanced by the governor springs. Next assume that 1 Newton force (weight of 100 grams) is required to move the steam valve.

The centrifugal force of the weights must then be increased from 4.38 to 5.38 Newtons for two weights or to 2.69 Newtons for one weight.

Transposing the terms in equation (1) gives

$$\omega^2 = \frac{F}{M \times R} \qquad \text{which simplifies to}$$

$$\omega = \sqrt{\frac{F}{M \times R}} \qquad \text{equation (2)}$$

substituting values gives

$$\omega = \sqrt{\frac{2.69}{0.005 \times 0.01}}$$

This gives ω = 232 radians per second or

$$\frac{232 \times 60}{3.142 \times 2} = 2215 \text{ rev/min}$$

This means the governor will stick in the same position until the speed exceeds 2215 rev/min. Or put another way, the speed must increase by 215 rev/min before anything moves.

Governor instability

So far, only the forces acting with the governor weights at one radius have been considered. In practice the weights move from an inner radius (at full-load) to an outer radius (at no-load) and there are stops at both ends to limit travel. If the governor spring rate (stiffness) is not high enough, the weights will fly to the outer position and stick there until, by putting load on the engine, the speed has been dragged down to an unacceptable low value. In models, that is a common reason for instability and loss of control. Friction in the governor and regulator valve makes matters very much worse.

Concluding remarks

In full-size practice, the simple equation (1) is the starting point for all governor calculations. Even with very large machines the forces required to do the actual control are not known with any high degree of accuracy and for this reason the actuator, which is controlled by the governor pendulum, is designed to have a very large excess capacity. The modeller may ask "what is the point of doing a calculation if we do not know what the operating forces will be?" The reply to that is "at least we can head in the right direction and if there is a problem then have some idea of the cause". The following may be taken as a general guide.

- Operate the governor at the highest possible speed and accept the fact that the belt or gear drive ratio between crankshaft and pendulum is not true to scale.
- Accept the fact that control valves cannot be accurately scaled to model size, in particular the clearances.
- Keep friction in all control rods, pivot points and steam seals to the absolute minimum.
- Remember that valves such as piston valves and butterfly valves may appear to be balanced but in fact they are not. This has nothing to do with friction forces.
- Consider the possibility of putting a very simple force booster between the pendulum and the regulator valve.
- For low-speed operation, reduce boiler pressure as far as possible. This will minimize the force required to move the regulator valve and also make valve travel versus steam flow much less critical.

Maritime Matters

with Leigh Adams

One man's models (stolen)

From time to time I have read short articles in model magazines reporting on models which have been stolen from vehicles, club storerooms and workshops. This has to be one of the lowest acts of theft. Stealing not only someone's model, but thousands of a craftsman's hours and skill, donated to the project with a passion for the subject.

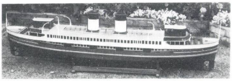
A few weeks ago I received a phone call which could not have hit closer to home, my father telling me that his workshop had been broken into overnight and four models were stolen. These models encompass some 10 years of work and countless hours.

The warning is there, lock up your workshop and have photographs of your models!

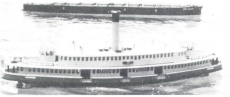
Three of these four models have been featured in AME.

- *South Steyne* — ferry,
  AME Jan-Feb 1993, page 39.
- *Kanangra* — ferry,
  AME July-August 1994, pp 9,10 and 11.
- *Lady Winifred* — open steam launch,
  AME May-June 1992, pages 30 and 31.
- *Mirus* — luxury cruiser.

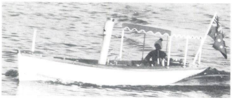
If you are offered these models or hear anything, please contact:
Ron Adams (02) 451 2002 or AME.



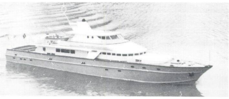
South Steyne



Kanangra



Lady Winifred



Mirus

*Fishing Trawler **Ben** built by Abhi Titchmarsh.*

Maritime Model Club of NSW

Anzac Regatta, 28 April

Modellers from around New South Wales made the trip to Middle Creek, Narrabeen for MMC's annual regatta.The recent rain had the creek swelling to capacity creating plenty of water for model boats. This venue has been built up over the last twelve years by a band of dedicated members, building tables, fences, mowing lawns and constantly improving facilities for modellers and visitors alike.

Some new models were on show, Alan Fern from HDMES ran his RAF tender, this is another high quality model from the Fern shipyard. A new fibreglass hull is now available in 1/32 scale for the Huon Class Minehunter (APS Models) and with ten hulls now sold, we will see more maiden voyages soon.

Every event seems to be growing with an influx of new members and models. The variety of styles and scales taking to the water provided a continuous display for those who attended.

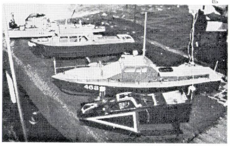
A great day messing about with boats!

Hornsby and District Model Engineers' 3rd annual regatta

Fagan park, Galston, is a great venue for sailing model boats, so after unloading my wife, kids, bikes, chairs, lunch, and the all important model boat — only to discover the gas bottle to fire the boiler was empty — the day had started really well, but as they say *A bad day at model boats is better than a good day at work!* I decided to have morning tea and catch up with some people I haven't seen for a while.

HDMES had organized marquees around the edge of the lake, providing tea, coffee, cake and sausage sandwiches, all of which went down well. Meanwhile, back on the water, the traffic was getting heavy with model boats of many varieties and styles cruising around. A continuous display of sail, steam and electric vessels had picnickers joining in with club members to enjoy the day.

Unfortunately, banks of dark clouds threatened to put a damper on the day and around 2pm light showers had modellers running for cover. However, thanks to Alan Fern and fellow HDMES members, a good day was had by all and we'll certainly be back next year!



A sample of work from members of the Townsville Model Boat Club.

Marine Plant — Burners and Boilers

Part two — Jack Henshall concludes his story on simple marine plant

Photos supplied by Jack Henshall. Drawings for publication by Dave Adams

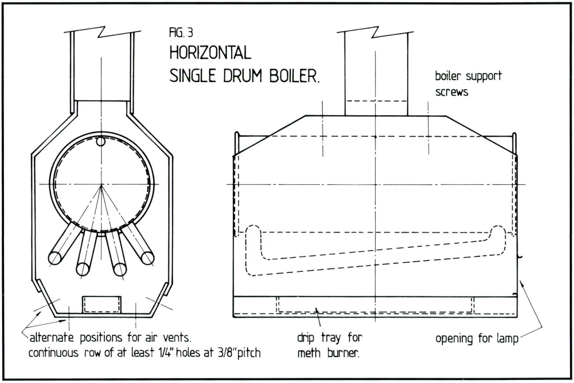


FIG. 3 HORIZONTAL SINGLE DRUM BOILER.
boiler support screws
alternate positions for air vents.
continuous row of at least 1/4" holes at 3/8" pitch
drip tray for meth burner.
opening for lamp

Pressure vessel

Many people regard boilers and other pressure vessels as objects from which to keep their distance, on the grounds that they are "an accident just waiting to happen". At the other extreme are those builders and users of steam plants who are oblivious to any danger and are only intent on seeing the wheels go round, faster and faster!

The miniature steam locomotive fraternity recognized that, to protect themselves and their patrons from possibly a gallon or so of scalding water at around 300 degrees F, propelled by a pressure of up to 100 psi, approved safety standards for the design, construction and testing of small boilers are essential. These standards, available from their clubs, are easy to follow and readily met. The testing procedures for boiler acceptance and certification are straightforward. Boilers of less than 50 mm (2" nominal) diameter, holding less than 1 litre (61 cubic inches) and operating at less than 250 kPa (36 psi) do not require a certificate. For 61 cubic inches of water in a 50mm (2") diameter drum, the drum length would be approximately 19.4 inches. Exemption from a certificate should not be taken to imply that such boilers do not have to meet the design, construction and test requirements of these safety standards. The standards are based on sound engineering practices which, for the safety of all, must be observed for any potentially hazardous equipment. Most boilers for small and medium sized ship models would not require to have a certificate but for the peace of mind of any operator of models in public, such a certificate should be obtained if at all possible.

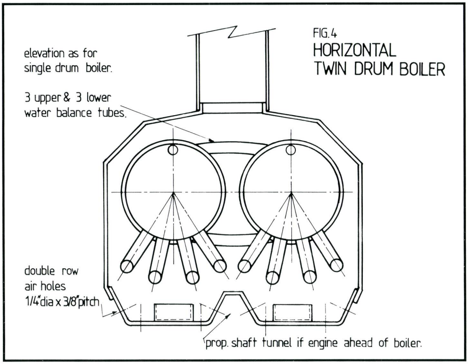


FIG. 4 HORIZONTAL TWIN DRUM BOILER
elevation as for single drum boiler.
3 upper & 3 lower water balance tubes.
double row air holes 1/4"dia x 3/8"pitch
prop. shaft tunnel if engine ahead of boiler.

Simple stress analysis of a cylindrical pressure vessel shows that for a given pressure and allowable stress in the shell, the shell thickness varies directly as the diameter of the cylinder. In model marine installations where plant weight can be critical, the significance of this statement is that small is beautiful. Per inch length of boiler, the weight of material in the shell, proportioned to the product of the mean circumference of the cylinder and its thickness, varies as the square of the diameter. Furthermore, the weight of water in the drum, proportional to the cross-sectional area, is proportional to the square of the diameter. Hence, for a given length of boiler, reducing the drum diameter from 2 inch to 1½ inches reduces the weight by 44% while reducing the heating surface of the drum by only 25%. Any heating surface from tube banks additional to the drum is unlikely to be changed. Alternatively, using two drums 1½ inches diameter in place of a two-inch drum would increase

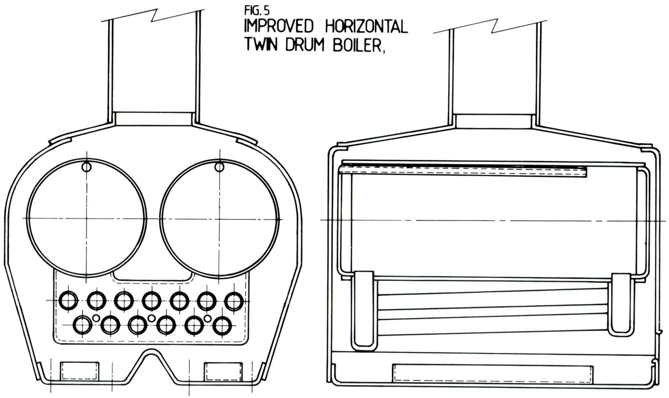
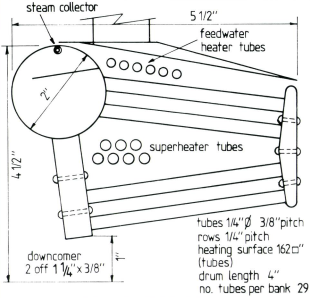


FIG. 5
IMPROVED HORIZONTAL TWIN DRUM BOILER,



tubes 1/4"Ø 3/8" pitch
rows 1/4" pitch
heating surface 162□" (tubes)
drum length 4"
no. tubes per bank 29

FIG. 6 TRANSVERSE DRUM BOILER

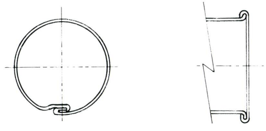


FIG. 2a
tinsmith's seam

Thickness exaggerated for clarity sheet annealed cleaned and tinned both sides all edges before folding. Fold cut back to one thickness at each end for ⅛" before flanging outwards.

FIG. 2b
folded-on end plate

End plate annealed and flanged all round over 12 swg (0.104 inch) former, annealed, cleaned and tinned around inside flange and edge of end plate before folding over flanges on end of drum.

Caulk ends and seam with solder over spirit or gas flame, running solder into joints with tinned wire scratcher.

FIG. 2 MECHANICAL JOINTS FOR SMALL DRUM BOILERS

the heating surface by 50% at the cost of a 12½% increase in weight.

Internally fired boilers, such as the straight-through flue launcher boiler and the return tube Scotch type with their large diameter external drum, have a weight penalty compared with equivalent externally fired boilers working at the same pressure. The weight of these boilers can be somewhat reduced by using lower pressure steam with larger engine capacities.

For those who like to try out their calculators, the required thickness of a cylindrical boiler shell is given by:

$$t = \frac{PD}{2fs}$$

where:

t = shell thickness in inches

P = required working pressure in psi

D = drum diameter in inches

fs = safe working stress in pounds/sq inch

The safe working stress for annealed copper has been accepted as 3000 psi, which allows a required factor of safety of at least eight on an ultimate tensile strength of 25 000 psi. This tensile strength includes an allowance for the reduction in strength of copper at the temperature of steam applicable to the working pressure of model locomotives.

For annealed brass the safe working stress would be 4000 psi, i.e. ultimate tensile strength of approximately 35 000 psi, allow-

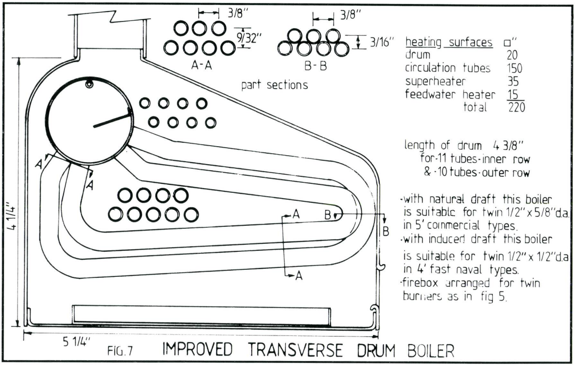

3/8"
9/32"
A-A
3/8"
3/16"
B-B
part sections
heating surfaces □"
drum 20
circulation tubes 150
superheater 35
feedwater heater 15
total 220
length of drum 4 3/8"
for 11 tubes-inner row
& 10 tubes-outer row
-with natural draft this boiler is suitable for twin 1/2"x5/8"d.a. in 5' commercial types.
-with induced draft this boiler is suitable for twin 1/2"x1/2"d.a in 4' fast naval types.
-firebox arranged for twin burners as in fig 5.
4 1/4"
5 1/4"
A'
A
B

FIG.7 IMPROVED TRANSVERSE DRUM BOILER

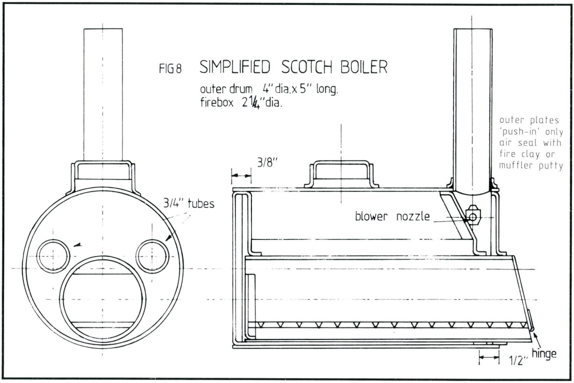


FIG8 SIMPLIFIED SCOTCH BOILER

outer drum 4" dia.x 5" long.
firebox 2¼"dia.

3/4" tubes
3/8"
blower nozzle
outer plates 'push-in' only air seal with fire clay or muffler putty
1/2"
hinge

ing some reduction for the uncertainty of the composition and annealed state.

Somewhat thicker shells than given by the above simple relationship will be required if the drum is rolled from sheet with a riveted longitudinal joint, which obviously reduces the plate area along the rivet line. Detailed calculations for such joints and for securing the end plates and their support are covered in the many texts available on model boilermaking.

It should be noted that boiler design is based on the required working pressure to be set on the safety valve and not for the pressure used in the testing procedures. The two certification tests are a hydraulic test on a full, cold boiler at twice the working pressure and a live steam test at working pressure for confirmation that the safety valve is adequate to limit the boiler pressure and maximum steaming rate to not more than 10% above working pressure. It is accepted that the cold hydraulic test is at a stress having a somewhat lower factor of safety, and may cause some initial settling in of the shape of the boiler plates.

For a drum subject to external pressure, such as the firebox for a Scotch boiler, where any distortion from the perfect cylinder could initiate a tendency to a complete collapse, an increased shell thickness of at least 30% is recommended. Similarly, end plates should be of thicker material and slightly domed outwards for better resistance against bending forces.

For newcomers to miniature boiler making, particularly lone hands away from clubs, and unlikely to possess equipment for hard (silver) soldering, the use of soft (lead/tin) solder can be a quite acceptable alternative for modest marine boilers [note: this applies to boilers operating at less than 250 kPa (36 psi) and a barrel diameter less than 50mm, and a water capacity of less than 1 litre, which do not require AMBSC certification and *definitely* doesn't apply to locomotive boilers, which should be built to AMBSC codes which require silver soldering... bmc]. However, a word of warning is needed: it can be an expensive business to take your boiler parts to the average oxy welder. An oxy-acetylene torch is far too hot and concentrated for the relatively light-gauge copper of most marine boilers, so ask to see, if possible, any similar sort of boiler he has put together. It is probably better to try your friendly plumber: his LPG torch and phoscopper eutectic rods used on Yorkshire-type thin copper fittings are suitable for our purpose. [Phos. copper rods with less than 15% silver are best not used on boilers, particularly if solid fuels are to be used. They are strongly attacked by sulphur bearing flue gasses... bmc]

Back to soft solder: in the early years of miniature locomotives it was standard practice on firebox stays to caulk around the nuts inside and outside the fire box with soft solder, so you can use it as a sealant for a mechanically jointed pressure vessel, and around rivets, screws or folded seams that provide the strength. The simplified Scotch return tube boilers detailed later were all riveted, soft-soldered assemblies. For light-gauge shells of less than 0.020 inches thick, the tinsmith's folded joint (Fig 2a) and an externally flanged-on end plate (Fig 2b) are suitable for

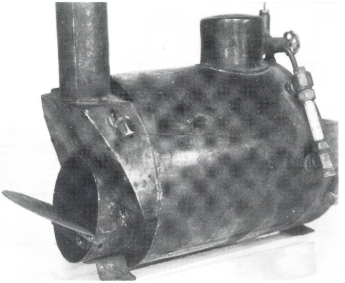


Photo 7a: *Simplified Scotch Boiler (front)*

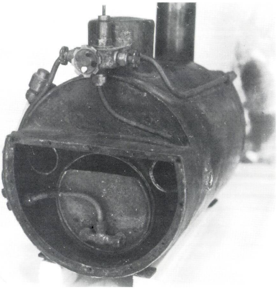


Photo 7b: *Simplified Scotch Boiler (back with cover removed)*

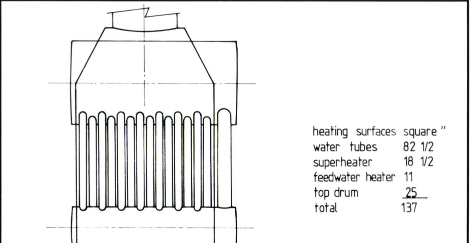


FIG 9. YARROW BOILER.

small boilers of 1¾ inch diameter or less at working at pressures up to 20 psi. The extra diameter around the end plate is of no consequence as at least ¼ inch is needed for the hot gases around the drum to the flue. So why not a soft-solder sealed job for your first attempt?

Boiler configurations

To complete this review of burners and boilers, I'll outline a number of types and sizes of boilers used in successful steamers to indicate possible solutions to some of the needs in the wide field of interests of ship modellers. Other arrangement s for light, fast-steaming boilers can be found in texts on steam cars and steam wagons.

The simple boiler shown (Fig 3), comprising a horizontal drum with longitudinal water circulation/heading surface tubes underneath, is easy to build and entirely satisfactory in small and medium sized models. For increased power, a twin drum arrangement (Fig 4) of this basic boiler is preferable to an enlarged single drum. For a greater heat exchanger surface in a small boiler, as needed for higher specific steaming rates, the circulation tubes can be replaced by a multi-row tube-bank between down-comers at the ends of the drums (Fig 5). These types of boilers are usually installed with the axis of the drum along the length of the ship.

For higher specific steaming rates, a boiler configuration with a side-drum transversely across the ship, with two tube banks connecting with headers (Fig 6), does not significantly increase the height of the boiler but provides considerable heating surface for a small drum. Figure 7 shows a variant of this type using continuous tubes in place of headers, which are a potential source of weakness.

Both types of these watertube boilers can be fired by methylated spirits or a silent kerosene blue-flame burner, using either natural or induced draft.

For a solid-fuel fired boiler, the simplified Scotch return tube type (Fig 8) is excellent. It takes little more effort to build than the watertube types previously described, taking into account the work in their external casings. Induced draft is essential for the Scotch boiler.

The Yarrow boiler (Fig 9) has the best steaming rate and with its small diameter pressure vessel is ideal for high pressures. However, the boiler is quite high when a reasonable length of heater tube is used, requiring the ship model to have suitable deck houses to cover the boiler. Again spirit or kerosene burners, with natural or induced draft, can be used.

Table 2 (part 1) provides details of boilers as described above, together with the engine capacity and ships in which they were used.

Recommendations

From Table 2, calculation of the heating surface used for the various engine sizes indicates that 150 to 200 square inches of heating surface per cubic inch of engine capacity (per revolution) is adequate for sedate commercial types of models, and th at possibly double this is needed to power fast recreational and naval types. These figures can only be an initial guide, and should be subject to closer consideration taking into account the details of the proposed plant, such as: natural or induced draft, fuel and its burner, boiler feed, effectiveness of superheaters and feedwater heaters, engine valve gear and no doubt many others.

To return, at last, to the requirements for a boiler for a marketable marine plant, it is believed that three types of boilers, with two sizes in each of two types would be required if the needs of the majority of model ship builders are to be met. Table 3 lists the types of boilers, their main dimensions and the ship type and size in which they could be used. If only one boiler is to be produced, then the larger size of the simple single-drum pot boiler, used with either natural or induced draft, would probably have the greatest number of sales.

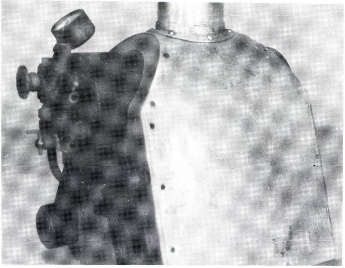


Photo 8a: *Yarrow Boiler (Front)*

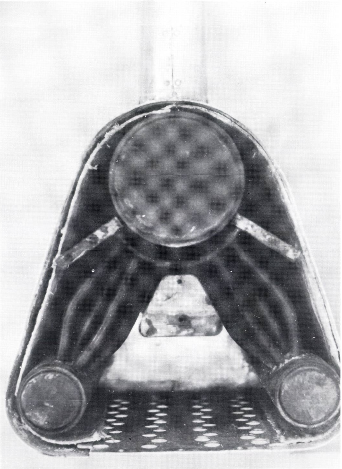


Photo 8b: *Yarrow Boiler (Rear with cover removed)*

Thanks

I'd like to thank Ted Butt, who generously revealed the secrets of his entrancing, briquette burning, simplified Scotch return tube boilers, their construction and easy steam raising; and Ash Dodge, who first used the needle-valve-controlled methylated spirit burner so ideally suited to marine plants, providing considerable power for larger models with long running times in an extremely simple and convenient burner.

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A 5" gauge NSWGR 422 class Diesel Outline Locomotive

Part 21 of the construction of a battery electric locomotive

Brian Carter and Ken Stone describe the diesel sound simulation system

Electronic drawings from Talking Electronics, speaker box drawings by Brian Carter. Photos by Talking Electronics, Neil Graham and Brian Carter

Brian starts the story...

Yes, it's finally arrived — the long awaited diesel engine sound simulator! The circuit we used was developed by Ken Stone and marketed through Talking Electronics Pty Ltd who have kindly given AME permission to reproduce the construction story, diagrams and photos of this simulator from their excellent book *Electronics for Model Railways Book 2*, published in 1990 by Ken Stone for Talking Electronics.

The book details the diesel sound simulator in three versions, all intended for N, HO, etc., electric mice (oops — railways). The version I chose for the 422 is Ken's version 3. It is a four-watt unit designed to be fitted into a controller case. The other two versions have a lower wattage and are small enough to fit into an HO locomotive. The "Diesel Sound 3" kit is available for under $20, the speaker for just under $55. Add the plywood speaker box and small hardware items and you should have the sound project for less than $100.

Warning: the electronic sound simulator from Talking Electronics, as described in this episode, is only available in kit form — you have to solder the components onto the printed circuit board. You may need to ask an electronically oriented friend for assistance if you feel uncertain about the procedure.

Since I built this simulator, several other types have been introduced by a variety of companies. Some are ready-to-run up to $500 each, others are do-it-yourself kits. All versions require a speaker: sold seperately. I decided not to try them out as I was more than satisfied with the effect I had achieved with Ken Stone's circuit.

The output quality of the simulated diesel sound, while dependent on the simulator circuitry, is greatly influenced by the speaker used. After completing the simulator, I connected a spare 150mm mid-range speaker to try it out. The simulator worked straight away, although the tone was disappointing. It wasn't a GM engine by a long shot — more like a sick Alco. I found an old 3-way car speaker I had packed away (I don't throw away as much junk as I should!). With the 3-way connected I switched on the simulator again: a little better but still lacks the GM throb, at least it sounded like a cured Alco: actually, it wasn't far removed from the NSWSRA 81 class sound.

While I was "playing" with the simulator — I was pleased I got it to work — I noticed some of the lower tones coming through the base cone. They didn't sound too bad but there were too many higher frequency sounds spoiling the effect I was hoping for. My scrap box didn't have a low frequency speaker and they aren't cheap to purchase for an experiment. After a bit more convincing with the 3-way speaker, I decided to take the plunge and purchase a 200mm woofer.

At last — the GM chant!

After switching it on, the first thing I noticed were the rattling glass doors on a display case about three metres away. What a difference! Just what I was searching for. However, while the base response of the speaker was adequate, I was still not getting that deep two-cycle throb so characteristic of GM-powered locomotives.

I had intended to build a resonating box around the speaker but I was stumped with the problem of fitting it in the body of the loco. While the genesis of the enclosure design was gurgling around in my head, one of the other 422 project members discovered some information on our ears' response to various sound frequencies. It seems that the human ear can easily determine the source of medium to high frequency sounds. However, with low frequency sound, the direction of the source is not readily apparent to our ears. The low frequency sounds are "felt" as much as heard.

This characteristic relieved the potential problem of speaker installation. The original intention was to mount the speaker with the cone pointing skyward to direct the sound towards the innocent by-standers — I can just imagine "no diesel noise parties" springing up in defence of passing plane travellers! As it turned out, it wasn't necessary — I could now point the speaker anywhere.

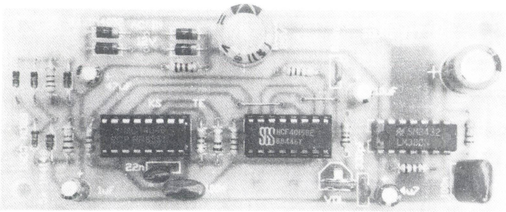
I then placed the speaker enclosure so that the speaker faced down towards the track at about 45 degrees. This solved two problems. Fitting the speaker into the loco body was no longer a headache, and getting the low frequency sounds out of the locomotive was no longer a problem.

After the speaker enclosure was completed and installed in the loco body, a road test was carried out. The deep two-cycle chant now had a full rich tone as it reverberated off the track. The higher frequency sounds of the turbine whine on deceleration appeared to emanate from the centre of the body. All things considered, I am pleased with the "two-stroke diesel engine" in our locomotive.

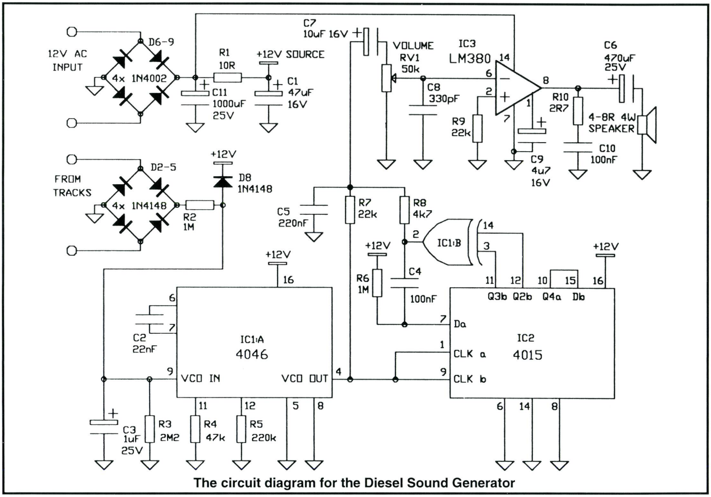
I will treat the construction details as a two section exercise. The first section, from Ken's book, will deal with the circuit details. In the second section, I will describe circuit modifications, the speaker, construction and fitting of the speaker housing, and fitting the circuit to the loco.

Ken Stone describes the diesel sound circuit

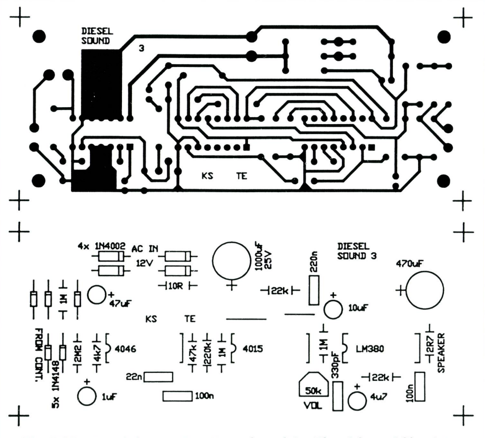
Back in 1980, I became immensely interested in sound effects and music. As I was only a student at the time, a synthesizer was beyond my financial reach until my father came to the rescue at Christmas. But before that, I had to make do with what I could afford with my dollar-a-week allowance. So armed with a



The big one. Everybody will know when you fire up this one!



The circuit diagram for the Diesel Sound Generator

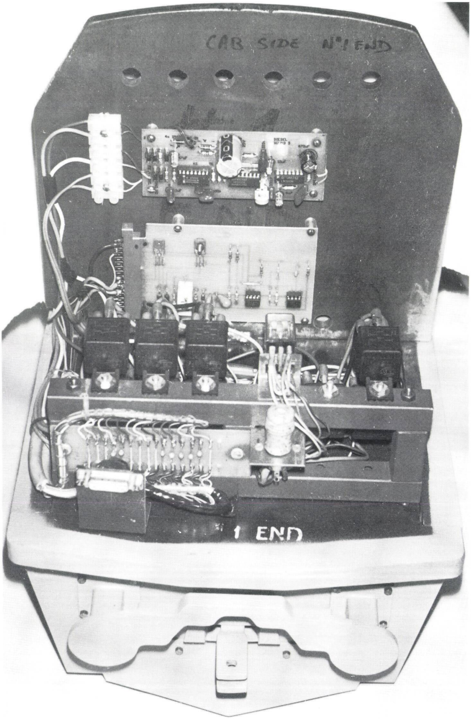


**The PCB artwork for our 4 watt version of the Diesel Sound Simulator
All component information is on the overlay**

handful of chips bought for twenty five cents each when a local electronics shop decided to clear its range of CMOS, I sat down at my desk and started work on my well-used piece of proto-board. The creation I assembled used a 4021 shift register, about three 4046 VCOs and some exclusive-OR gates, either a 4070 or the ones integral to the 4046. It was basically a digital pseudo-random noise generator.

What does this have to do with model railways I hear you ask. This rats-nest produced the best range of sound effects I have ever heard from something so cheap, including convincing steam and diesel engine effects. As I wasn't all that keen on model railways at the time, the potential of this circuit never occurred to me. Many years later I saw a similar, though simpler circuit as a design idea in a model railway magazine. That started me thinking again.

The following project is the result. This printed circuit board is fairly compact and should present no problems to any constructor, as it is neatly laid out with reasonable spaces between components. Good construction skills are preferred, as are a fine tipped temperature controlled soldering iron and a pair of good quality side cutters.



View of No.1 end. The sound board is the very top circuit mounted on the bulkhead. The triangular wave generator is just below, also mounted on the bulkhead.

Sound — Parts List

4 watt version

Qty	Description
Resistors	
1	2R7 or 2R2
1	10R
1	4k7
2	22k
1	47k
1	220k
3	1M
1	2M2
1	50k Mini Trimpot
Capacitors	
1	330pF Ceramic
1	22nF Greencap
2	100nF Greencap
1	220nF Monoblock
1	1uF 25V Electro
1	4u7 16V Electro
1	10uF 16V Electro
1	47uF 16V Electro
1	470uF 16V Electro
1	1000uF 25V Electro
Diodes, etc.	
9	1N4002 (5 replace the 1N4148 shown on the circuit overlay.)
1	4015 Shift Register
1	4046 VCO
1	LM380 Audio Amp IC
1	Diesel Sound 3 PCB

All available in kit form from:
Talking Electronics Pty Ltd,
35 Rosewarne Avenue
Cheltenham, Victoria, 3192.
Phone (03) 9584 2386
Fax (03) 9583 1854.

Hardware

Speaker
1 Dick Smith catalogue number C-2034
Wire
1m (0.22mm^2) Dick Smith No. W-2010
Connectors
1 Dick Smith RCA Plug (black) P-1422
1 Dick Smith RCA Socket (black) P-1412
Plywood
7mm thick, 3 or 5 ply.
600mm x 600mm sheet (minimum)

How it works

The circuit can be looked at as several parts. The first part is the input bridge rectifier. This makes sure power of the correct polarity is always fed to the diesel sound generator. It feeds power to two circuit sections. C1 smoothes the output of pulse type throttles into a usable constant voltage. D1 prevents any voltage held in the capacitor from being fed back to the second circuit section that is connected to the input bridge. The second section is the speed detector. The voltage from the throttle [in our case, the triangular wave generator... bmc] is fed to the control pin of the voltage controlled oscillator in the 4046. As the throttle voltage is varied to control the speed of the locomotive, it will also modulate the frequency of the VCO, changing the simulated diesel's revs. So the faster the train goes, the faster the engine will sound. As a real diesel engine contains a lot of rotating mass, the rate at which it can rev up or slow down is limited. C3, along with its discharge resistor R3, simulates this inertia effect.

The next section of the circuit is the pseudo-random noise generator. It is this section that actually generates the characteristic diesel throb. It consists of a seven stage shift register with its two last outputs Exclusive-0R'ed together and fed back into its input. The square wave output of the VCO is used to clock the 4015 shift register. On each positive transition of the square wave, the data that is on pin 7 of the shift register is clocked into its first stage. At the same time the data in the first stage is clocked into its second stage, the data in the second stage is clocked into its third stage and so on. The data is eventually lost when it is clocked out of the eighth stage. The 4015 is really a dual 4 stage shift register with each stage having its own output pin. By feeding the last output of the first shift register into the data input of the second one, we have made an eight stage shift register. In this circuit, the outputs are taken from stages six and seven. The eighth stage is not used. The Exclusive-OR gate compares outputs six and seven of the shift register, its output reflecting what is at the input pins. If either input is high, the output of the Exclusive-OR gate will also be high, but if neither or both inputs are high, the output will be low. This output is fed back into the shift register, and will soon be clocked through to outputs six and seven again. This results in an almost random stream of logic levels at the output of the Exclusive-OR gate. It is in fact a repeating cycle. Varying the number of stages in the shift register will vary the pattern. Seven stages seems to be the most suitable. C4 and R6 are there to kick start the generator. It is possible that the shift register will start with all of its stages containing lows. And as a low compared with a low always give a low, the pseudo-random sequence will never start. C4 and R6 hold the input high long enough for one or two highs to be clocked into the shift register. If your unit fails to start, reduce the value of R6. The frequency of the VCO controls the rate at which the shift register is driven, thereby modifying the "throb" rate according to speed. R7, R8 and C5 form a simple mixer and filter. The output of the pseudo-random noise generator is mixed with a little of the VCO's direct output and then the higher frequency component of the signal is shunted to the common rail via C5, while the remaining signal is amplified and sent to the speaker. The VCO's direct output is used to simulate the whine of a supercharger. If you do not require the effect, leave out the 22k resistor R7 [we leave it in... bmc].

Construction

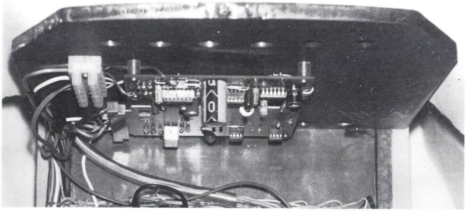
The components are now mounted on the circuit board. Take out microscope and surgical tweezers... well nearly! Check the board closely for any manufacturing errors such as shorts between tracks or track breakages caused by over-etching. Clean up shorts with a sharp hobby knife and repair tracks by soldering single strands of wire taken from a length of flex. If you must do this, it is easier to wait until the components are all soldered to the board. Just don't forget if you leave it to later!

If you refer to the construction drawings you will see that there are several links. The shorter ones can be tinned copper wire. The longer ones will need to be insulated. There is a link that is actually soldered between two resistors on the top side of the board. The overlay on the board shows which end the body of the resistors should be placed on. Refer to the photographs for the physical orientation of the diodes: only their electrical orientation is on the overlay. The diode described as 12V is the 12 volt zener used in the regulator. The capacitors should all be of the monolithic ceramic or monobloc type, once again to conserve space. Try to use small canned electrolytics too. The size of the 100uF capacitors varies a lot depending on manufacturer and age. Do not substitute metal bodied transistors for the plastic ones recommended, or short circuits are sure to result.

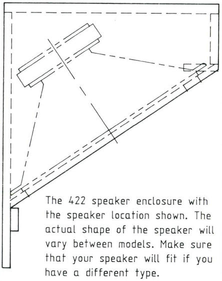
Do not use a socket for the LM380, as it uses the copper on the printed circuit board as a heatsink. The copper provided for the job is really not enough to dissipate the heat generated if the amplifier is run flat out for extended periods of time, but I doubt anyone will. Besides, the supply voltage is a little on the low side to allow full output power to be attained.

Compatibility with throttles

The diesel sound generator responds differently to various types of throttles. I have tried it on all that were available to me at the time of writing. As it stands, it works well on pulse-type throttles. I imagine it would work just as well on any other pulse-type throttle. It is also completely compatible with variable voltage throttles. However, old current controlling throttles, that is any that use a rheostat to control speed, tend to make the diesel sound generator over-rev. Some juggling with the input voltage divider would cure the problem, but I have found the simplest and most effective method is to reduce the battery voltage to six volts. The unit will be a little quieter at idle, but will otherwise behave normally.



This view is to show the plastic stand-offs used to keep the sound and TWG circuit boards away from the steel bulkhead. You can purchase them from an electronics supplier or make them as I did from a piece of 12mm diameter perspex rod, drilled with a 3.5mm diameter hole and parted off 12mm long. Mount the board with M3 x 20mm or 1/8"BSW x 3/4" long round head screws.



The 422 speaker enclosure with the speaker location shown. The actual shape of the speaker will vary between models. Make sure that your speaker will fit if you have a different type.

422 SPEAKER ENCLOSURE

Brian takes over from Ken to describe circuit modifications, the speaker, enclosure and mounting.

Circuit modifications

A small change to the components was necessary after a fault developed when I ran the sound unit for a lengthy dry-run before fitting it to the locomotive. Ken uses five 1N4148 signal diodes as a bridge rectifier from the track voltage (in our case read: triangular wave generator voltage). These diodes are satisfactory for the intended use on model railway layouts. However, they did not stand up to my rigorous testing and burnt out: the circuit had to be 422 proof! I replaced the five 1N1418 diodes with five 1N4002 diodes and the problem was solved. I've made a note about this on the parts list. You'll need five extra 1N4002 diodes if you purchase the kit from Talking Electronics.

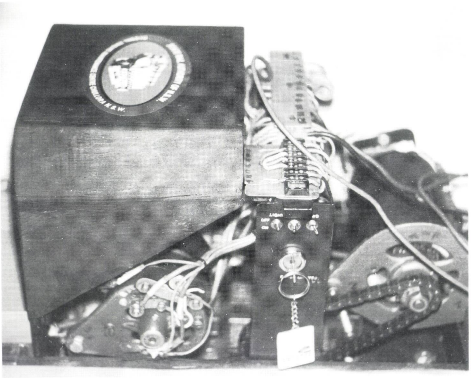
No other modifications were made to the circuit.

Home made PCB

To make sure that all was well with the design, I had the printed circuit board etched by a colleague, Rick Fletcher, from the drawing reproduced on the previous page. I then purchased all of the components from a local Dick Smith electronics store. If you don't have access to PCB etching facilities, you can purchase a board from Talking Electronics.

After I had the PCB etched, and before I drilled the holes, I photocopied the component overlay on to an overhead projector transparency. I cut the overlay out of the transparency and — with a very thin film of araldite — glued it to the non-copper side of the PCB. Make sure you get it the right way around! When the adhesive is dry, proceed to drill the component pads.

After cranking up the soldering iron, I gradually mounted all of the components onto the board. Before you connect power to the board, check that you haven't accidentally soldered across tracks, etc. The sound worked



As you can see, there is not much room to play with. The mansard shape of the enclosure is a snug fit inside the body panel.

straight away, so I have no hesitation in recommending this circuit.

The speaker

It goes without saying that the final product has to sound right! Besides the sound, there are two main considerations when choosing the speaker: first, it has to fit the space available. Second: it has to withstand some arduous conditions.

The biggest problem is fitting a speaker in the body of the 422 — there is precious little space left. After sketching the outlines of a couple of locations, I found that I could just squeeze a 200mm speaker between the No.1 bulkhead and the nearest C40 drive motor.

Driving the 422 is an outdoor activity, so the mechanism has to withstand outdoor conditions. My main concern was wet weather or humid conditions, there is little chance of direct sunlight causing any internal problems. However, the heat emitted from the traction motors is a possible cause of trouble. Fortunately, speakers these days come with a choice of cone materials. The standard paper cone variety — commonly used in car speakers — is likely to be affected with damp weather. The best damp-proof cone available is made from a polypropylene membrane.

With the size confirmed, I shopped around for a 200mm woofer with a polypropylene cone. The most appropriate one available was from Dick Smith Electronics. The catalogue number is C-2034. If this speaker is not available in your area you can try an alternative.

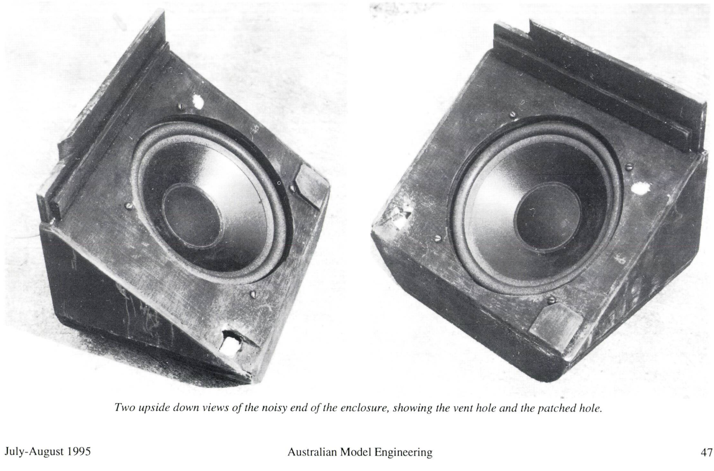
The specifications are:

Frequency response:	40 - 8000Hz
Coil impedance:	8 ohms
Rated input power:	30 watts
Max. input power:	60 watts
Free air resonance:	40Hz +/- 8Hz
Sensitivity:	92dB/W +/- 3dB @1W 0.5m
Magnet weight:	502g

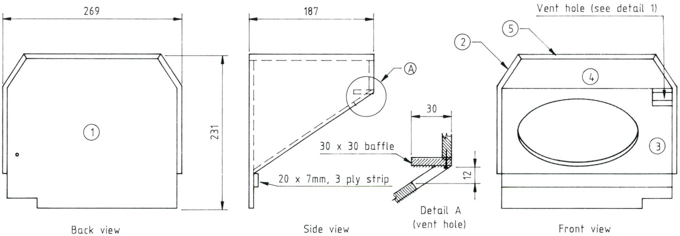
Speaker enclosure

Now comes the tricky bit — as if there hasn't been enough of those already!

A lot of modellers have been eagerly waiting for the sound system part of the 422 construction series for some time. There are a few that want to adapt the sound system to their own locomotive design. If you wish to apply the speaker to your own situation, then you will need to design a speaker enclosure to suit your own needs. 422 constructors can follow the words-and-music following.



Two upside down views of the noisy end of the enclosure, showing the vent hole and the patched hole.

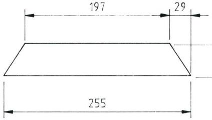


Back view

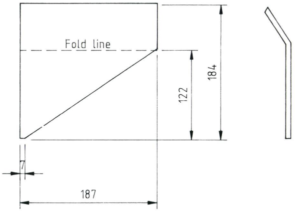
Side view

Front view

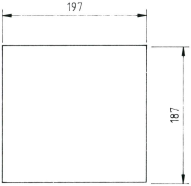
Speaker enclosure assembly



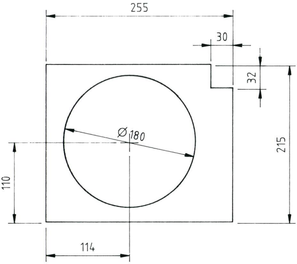
Item 4 - Front panel



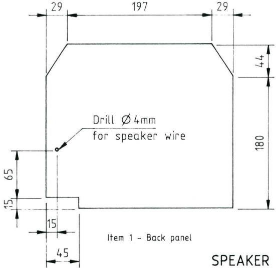
Item 2 - Side panels (2 req. 1 LH & 1 RH)



Item 5 - Top panel



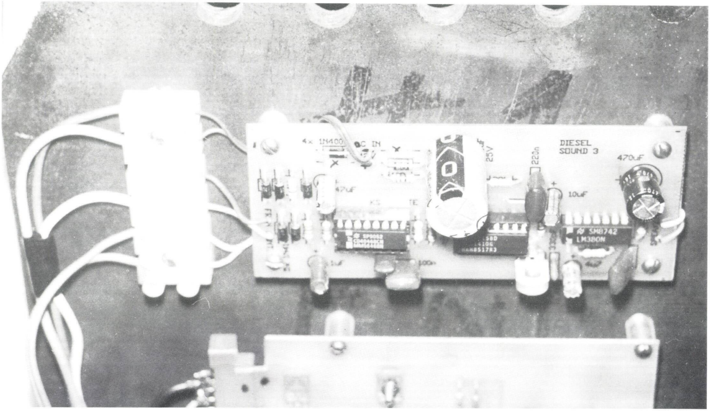
Item 3 - Speaker face



Item 1 - Back panel

SPEAKER ENCLOSURE COMPONENTS

bmc



A closer view of the board and the connection to the outside world. Any type of terminal strip will suffice for this project. The top two wires are for the 12 volt power supply; the centre left wire is the TWG connection; the lower two wires are to the speaker.

I built the sound system before the loco body was built. This meant that some minor changes to the enclosure's exterior dimensions were necessary after the body was made. This was the main reason for delaying the publication for the sound system, because ultimately you will have to make the enclosure to fit the space that you have available in your 422. Despite all of the "best laid plans", there are bound to be some differences between constructors' models.

Warning: the enclosure sizes are not cast in iron: use the dimensions shown on the plans as a basis for your enclosure and adjust the sizes to suit your available space.

Enclosure construction

Switch into carpenter mode: I once heard a comment by a carpenter friend who said that "metalworkers work to the nearest thou', woodworkers work to the nearest inch, and boat builders work to the nearest boat." No offence intended to our carpenters or boat builders!

To the Hi-Fi community, speaker enclosures are a scientific exercise. In our case we just don't have the space for an enclosure large enough for the speaker used. However, I felt a couple of Hi-Fi style concessions were necessary. The interior is lined with a layer of flannel material from an old sheet to kill any "hollow" sounds. I also added a vent hole to release the pressure waves from the enclosure. Actually there were two vents at first, but the sound tone changed. After blanking one hole the sound reverted to the correct tone. You can see the blanked-off hole in the photos.

The enclosure was made of 7mm thick, exterior grade three-ply. This size allows the box to be constructed without a supporting frame by fastening directly into the edges of the ply. I wouldn't use anything thinner than 5mm: not only because of the construction technique, but also because of the battering it will get from the sound waves. Whatever thickness of material you use, adjust the dimensions accordingly, so that you don't exceed your available space limitations.

An upside down view of the back of the enclosure

Assembly

The vibrant sound created by the generator made me wonder if the enclosure would be strong enough to withstand the constant vibration of the sound waves. I decided to make it a solid, lightweight sealed unit. The disadvantage is if the speaker fails in future, it has to be removed by dismantling the enclosure. The main advantage is that the sealed construction avoids the need for large sections required to attach a lid.

A portable power jigsaw is a handy tool for this job, but the box can be made easily with hand tools, a keyhole saw is required to cut out the speaker hole.

Make the back of the enclosure first. It has the upright bulkhead shape. Check to see if it will fit in the body of the loco, adding an allowance for the thickness of the material on the top and sides. Correct any errors in dimensions if your area is different to ours.

It doesn't matter in what order the rest of the components are made. When you have all the parts cut out and ready to assemble, glue some flannel or terry towelling on the areas that will be the interior of the box. Leave the joining areas free of covering. You could use either PVA or contact cement for this.

Lay the speaker in position over the hole and mark the location of the mounting screw holes. Drill the holes to suit. I used ¼"BSW steel round head screws and nuts — I couldn't get M6 screws at the time. When you fasten the speaker to its mounting face, apply a drop of 601 Loctite® to the thread and tighten the nut. You could use a spring washer as well — just make sure that the sonic vibrations won't undo the assembly! Don't underestimate the power of vibrations: I've seen an experiment where a 1"BSW nut was tightened with brute force from a heavy-set volunteer and then gently undone with vibrations set at the right frequency.

A front view of the noisy end!

Before you go any further: solder about 200mm of speaker wire to the speaker terminals. Use a two-colour wire so that you get the polarity right. I used grey wire with a black stripe along one length of wire. Connect the black-striped wire to the negative terminal and the plain wire to the positive terminal.

To avoid extra joins along the sides, I bent the mansard sides at the fold line indicated on the drawing. Don't be too elaborate about this: I just mounted the ply in the vice with the fold line at the top of the jaws and bumped it over until it reached the angle I needed. Try not to snap the ply in two with this procedure. Don't forget that there is a right-hand side and a left-hand side.

Before final assembly, glue and nail a strip of ply along the speaker side of the back, at the location shown on the plan. This strip is used to provide vertical support for the speaker face.

Pass the speaker wire through the hole in the back of the enclosure *before* sealing the box!

Glue and nail the sides to the back and speaker face. Then glue and nail the front panel in place. Fit the top face, trim the sizes to fit neatly together, then glue and nail this in place. QED as they say!

Fill up all the cracks with wood stop putty and paint the exterior matt black to protect the enclosure from the elements. Besides, it will look professional that way.

Fitting into the loco

The speaker box is not secured to the loco: the base of the back sits on the loco frame and the front leans against the wiring frame as shown in the photo. Hopefully, the back edge is at or near vertical and the speaker face clears the No.1 end motor. The loco body also keeps the enclosure in position.

The speaker wire has an RCA "line" plug and socket attached so that the enclosure can be removed quickly to service the motor.

Fitting the circuit

Mount the sound circuit board to the No.1 end bulkhead. If you haven't already drilled the mounting holes — as indicated in AME March-April 1993, issue 47, page 25 — then I suggest you do it now. Be sure to cover all of the existing electrical circuits to protect them from drilling-swarf.

You will need a six-connection terminal strip. Because of the wide variety of strips available, the hole positions weren't shown on the diagram in issue 47. Mark a location for your terminal strip as per the photo — the position is not critical — and drill a couple of 3.3mm diameter holes for fixing the strip to the bulkhead.

To make it easy to describe, number the connections on the strip from 1 to 6, beginning at the top of the strip.

Connecting the wires

For this section you will need to refer to the 422 circuit diagram on the centre pages of AME September-October 1993, issue 50. The circuit is labelled Figure 7. There was a small modification, figure 7a, in issue 52 page 42, but that does not affect the connections we need for the sound.

From the photo on page 45, you can see five wires on the left side of the terminal strip and six wires on the right of the strip. The top two wires are for the 12 volt power supply; the centre two wires are the Triangular Wave Generator connection and the lower two wires are for the speaker.

Power

The simulator board was designed for AC input off a model railway power controller. I have left the bridge rectifier intact as a protection, even though we are using DC input. Looking at Figure 7, the 12 volt power connection for the sound board is from the connecting strip labelled PCS (on page 31). Use terminal **12** for 0v (negative) and terminal **10** for positive 12 volts. The PCS is the Power Control Strip detailed in AME November-December 1993, issue 51, from page 36.

Some 5 amp wire would do for this job as there is very little power involved. Run the cables neatly from the PCS to the sound terminal strip 1 and 2. Because of the on-board bridge rectifier, it doesn't matter which polarity wire is connected to the sound board.

The PCB connection is "AC IN, 12V", solder short lengths of wire to run from the PCB power connections to the terminal strip.

Power switch connection

The positive 12 volt wire from PCS terminal **10** is routed via the centre accessory switch — SW3 — on "Accessory Panel A", shown on Figure 23, AME November-December 1993, issue 51, page 38. This enables the sound effect to be turned on to "idle" mode without the master key switch being "on". To change the engine revs, the master key switch must be in the "on" position. The SW3 switch details can be found in the Parts list on page 33 of issue 50. If you have been keeping up with the series, this switch should already be in place.

Speed

The two centre wires on the right of the strip go to the TWG for engine rev control. During installation, I found that only one wire needed to be connected for the circuit to work: hence the missing wire on the left side. I've left it as it is for those who intend using the sound circuit in another application. You may need both wires on a different system.

The PCB connection is labelled FROM CONT. This means "from controller" or "from tracks" as shown on the sound circuit diagram. Solder short lengths of wire to run from the PCB to the terminal strip.

The diesel engine revs up and down as the throttle is applied: this is a voltage dependent signal. The TWG's "S-WIRE" terminal receives a small variable voltage to suit our purpose. It is good that the signal voltage doesn't exceed about three volts — it means that the engine revs are not too high at full throttle.

For the sound "speed" control we use the terminal strip marked CCS (Figure 7 on the right of page 30). Connect the wire to terminal **2** (it's the one that the S-WIRE comes from). Run the wire back to the sound terminal strip 4.

Sound

The speaker connection is from sound terminal strip 5 and 6. Leave the speaker wires a few millimetres longer than required for a bit of flexibility when moving the speaker box around. Fit an RCA plug and socket to the wires for coupling to the speaker enclosure.

The speaker output from the PCB is on the right-hand end of the board, clearly marked SPEAKER. I ran the wire soldered to the speaker connections behind the board to the terminal strip.

The positive connection to the speaker is attached to the PCB track from the capacitor. Connect the speaker to the correct polarity or the cone will drive in reverse.

Testing

With the traction batteries in place, switch on the sound and hear what happens! Hopefully all will be well and you can enjoy a simulated GM 645E 16 cylinder diesel engine. If nothing happens, switch off the power and check your connections.

Enjoy playing with the sound system until the next issue!

To be continued...

Letter Box

ME — where to start?

Sir,

Your editorial in the March/April issue raised the question of people entering model engineering.

I live in a country town where it is difficult to access model engineering clubs and being extremely interested in undertaking a model engineering project feel that it would be invaluable if an article could be arranged on setting up a workshop.

The article would be a guide in selecting equipment to build a model, particularly machinery such as lathes, milling machines etc.

There must be experienced model engineers who can advise a new chum particularly with the amount of machinery commercially available and its complexity.

It would also be of interest when you feature models if information could be supplied on the availability of plans etc.

I have only been subscribing to your magazine for a short time and would love to start a project — but I have not been able to decide on where to start.

A. Cosgriff
Victoria

How about it modellers? Anyone want to write up a story about setting up a workshop? A perspective of several ideas would be great!

Plans are available from most of our advertisers... bmc

Bulk AME?

Sir,

Congratulations on your production of a fine magazine which clearly satisfies an important need for the modelling fraternity in Australia and New Zealand. I enjoy its contents enormously and in particular the occasional and well researched articles by Melanie Dennis and the quality of the magazine's illustrations and drawings.

May I also suggest that you review the magazines published to date and select a range of articles for republishing in an omnibus volume as a reference book. It could also include a selection of new B&W and colour photos, existing front cover photos and other material to illustrate articles and give extra value to your existing research, artwork and half-tones. I am sure it would be a good seller and on the basis of a 2500-3000 unit print run could be produced at an attractive price for sale in Australia and overseas.

Robert Carlisle
Victoria.

Thanks for kind remarks about the magazine Robert. About the other... We sometimes dream about such a project — but as volunteers it takes a commodity we have little enough of — time! Robert's letter cotinued on with the debate of the gauges included in the Open Forum... bmc.

Rumours!

Sir,

I read with interest "What Accident?" from Tom Winterbourne in the letterbox of the May-June issue of AME. This story was told to me by a usually reliable witness, but I didn't pass it on.

Where do these rumours come from? In the last few years I have heard that both Edgeworth and Ryde were to be evicted from their sites and at the present time our club is subject to a malicious whispering campaign. This is to the effect that the Hornsby and District Model Engineers Society is not a happy club and the Board of Directors doesn't know what it is doing.

In fact the Board concluded the purchase of our site on 22 December 1994, and has already paid off more than a quarter of the debt. To top that off, the same board was re-elected in March. The only unhappy people appear to be those who attempted to defy the Board over a breech of rules matter. They were politely pulled into line and have chosen to sulk ever since.

R. Sanderson
Vice Chairman, HDMES
New South Wales

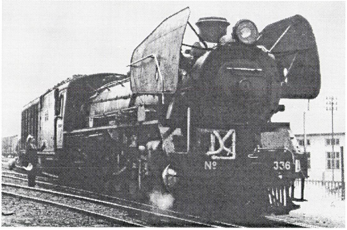
Steam in Southern Africa

Sir,

There has been some discussion in this magazine about the steam locomotive scene in Southern Africa.

A while ago I corresponded with the Southern African steam locomotive authorities and the following quotes from private correspondence may be of interest to readers:

01/01/80, Chief Mechanical Engineer, Zimbabwe Rhodesia Railways "...It will be noted that our term for this exercise is 'rehabilitation', as rather than any large scale attempt at modification, the object is basically to bring the locomotives back into service in a relatively reliable condition... The only modernisation of note is the replacement of all coupled wheel axleboxes... with roller bearing cannon bearing axle boxes fitted with manganese steel liners on the rubbing faces to minimise wear... The thermodynamic ideas of Mr Porta as applied to locomotives operating in Argentina have not been utilised on this system... In 1963 two 15th Class locomotives were fitted experimentally with Giesl ejectors, one of these locomotives having in addition a superheater booster fitted... The results, although showing some reduction in coal and water consumption did not come up to expectations..."



National Railways of Zimbabwe, Class 19c two cylinder simple 4-8-2 No 336 ***Silent Susie****.*

03/12/84, Acting Chief Mechanical Engineer, National Railways of Zimbabwe "...However, with reference to a new design of 'Straight' type steam locomotive, whose proposed wheel arrangement was to have been 4-10-4, this idea was shelved... No drawings or calculations were ever prepared... The policy of efficiency for our steam locomotives, bearing in mind their age, is dependent on financial justification... Your suggestion for this railway to negotiate with South Africa to lend their modified locomotives would cost us in the region of R400-R460 per day. Hypothetically speaking, would you or your country be willing to invest in this type of project?... With reference to Multijet Blast Pipes, nicknamed the "Pepperpot", these are fitted to 15th and 20/20A Class locomotives with lengthened petticoats and have improved steaming qualities considerably. Our findings were the result of eleven months trial..."

Even with the availability of corporate exhaust systems and amazing experiments being undertaken by South African Railways, Zimbabwe Railways was in a position only to emulate an exhaust system. Immense time and resources were required even to develop a single mechanical improvement such as their own in-house multijet exhaust system.

For Garratt locomotive modellers, the "Pepperpot" multijet exhaust mentioned above may be useful, as it appears to have been a development as a consequence of the specific requirements of the multi-cylinder articulated format. The drawing numbers for this exhaust system are L-9678 (Multijet Blast Pipe) and L-9679 (Lengthened Petticoat) and should still be available from Zimbabwe Railways.

To illustrate a Zimbabwe Railway's experimental steam locomotive I am enclosing a a photograph:

- 1. By courtesy of National Railways of Zimbabwe, Class 19c two-cylinder simple 4-8-2 No 336 (Henschel 27411/1954) 'Silent Susie'. This locomotive was built as a condenser format and lasted as such until 1957.
- 2. A similar condensing steam locomotive was run by South African Railways. Class 20 two-cylinder simple 2-10-2 No 2485 (SAR Pretoria 1935). This locomotive was rebuilt into a condenser format in 1950. Noted for the RC poppet valves. A photograph has not been obtained.

If Australian narrow gauge railway administrations had considered utilizing condensing steam locomotives then the domestic prototype may not have been too different from these two African examples.

Finally, there are three articles in magazines that I would like to draw to the attention of readers. The first two have some connection with the "What If... If Only..." series in this magazine:

1. *Model Engineer* Vol 174 No 3986 3-16 February 1995 pp 144-145. Tom Garner has started a series titled *Loco 21*. This series is looking at how the Porta and Wardale experiments as applied to railway steam locomotives can be further applied to model live steam locomotives.

2. *Australian Railway Enthusiast* Vol 32 No 4 December 1994 pp 16-21. Tony Marsden has started a two-part series titled *Steam Superpower in the 1990s Part 1*. This series is looking at the Porta and Wardale experiments as applied to railway steam locomotives.

3. *Railway Digest* Vol 32 No 11 November 1994 pp 16-17. Peter Jones wrote in an article titled "The National Environmental Engineering Initiatives — Powerhouse on Wheels" about a new 2-14-2+2-14-2 Garratt project that is proposed to be built in the Junee roundhouse. This project is receiving a lot of attention and the prototype is expected to be computer modelled and scale modelled to test the hypothesis.

James Tennant
Australian Capital Territory

Ground level 3½" gauge

Sir,

I was very interested in part of Noel Tyler's letter (AME Issue 59) where he mentions a 97-year "young" Carl Purinton riding a "...3½" gauge ground level at his home..."

Do any of our readers know of a 3½" ground level operating within Australia, either in a backyard or a club?

I would be eager to correspond with anyone with such information.

R. Cherry
New South Wales

The Hornsby and District Model Engineers' Galston Valley Railway has — I believe — the longest 3½" gauge ground level railway in the world! A 1km run non-stop. There are many other clubs with 3½" gauge ground level in Australia listed in Kenith Tinkler's Miniature Live Steam In Australia booklet... bmc

Early Australian publication!

Sir,

Whilst rummaging through a Sydney secondhand book shop the other day, I came across a copy of *The Model Engineer in Australia and New Zealand.* I have enclosed a photocopy of the cover, contents and an article for your perusal.

The magazine is dated February 17th, 1938 and is Vol. 3, No. 3. It was published, monthly, cost 6d and has about 28 pages.

I was wondering if any of the readers could give any information on this publication, when it was first and last published, are there any copies existing today, etc. Or perhaps AME has some knowledge of its, almost namesake and early predecessor.

I thank you for your attention to this matter.

Murray Arnison
New South Wales

Thanks for your vigilance Murray! As far as I know, the first issue appeared on 16 November 1935 and ended suddenly with the February 1939 issue. An article from the magazine was published in an earlier AME. We approached relatives of the Editor of ME in A & NZ for permission to reproduce articles from time to time. Some model engineers have advertised for copies wanted to complete their collections. I doubt if there are many complete volumes... bmc

Chaldron wagons and garden gauges

Sir,

Re: Steam Chest by Dave Harper, March/April issue: the wagons he illustrates are standard-type side-tipping skips, much used in mines, engineering excavations, quarries etc., and in the trenches in World War I. Lots of firms made them in gauges from 15 inches up to standard gauge, though 18", 20" and 2 feet were probably commonest.

The Chaldron wagons were wooden hoppers (fixed, not tipping), with wheels outside the frames. I think they had bottom doors for unloading in some cases, but others were tipped bodily to unload. Most had dumb buffers made by extending the wooden underframes. Very, very primitive!

I have been most interested to see the interest in garden railways in AME and hope that this will continue. I will contribute an article for the magazine if this would help.

Anyone interested in gauge 1 or G scale/16mm scale wishing to contact the WA Garden Railway Association is welcome to contact me after August 1st on (09) 457 2860 (tel. or fax.)

Jim Gregg
Western Australia

*See Jim's **Garden Gauges** ad elsewhere in this issue. Yes Jim, an article would help!... bmc*

Metal spinning — a reply

Many thanks for AME which arrived today. Further to Mr N. R. Endacott's letter, AME issue 60, page 58. The following information on metal spinning has appeared in *Model Engineer*:

Spinning of Sheet Metal — 13 Sept. 1951
Metal Spinning — 18 Sept. 1987
Metal Spinning — 1 Jan. 1988

If Mr Endacott requires further information, please let me know and I will endeavour to assist.

G. F. Collins
Sussex, England

Letterbox Contributions

Contributions of letters by mail to:
PO Box 136, Robertson, NSW, 2577 or
fax to: (02) 646 1362 are very welcome.

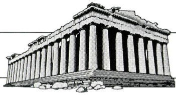
As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion — as long as they are not libellous, or downright unpleasant — will be considered for publication.

Please **type or clearly print** your letters, as script is often difficult for the typist to interpret.

The Letterbox is a popular forum, so space is limited. Therefore, letters of 400 words or less will have a better chance of being published.

bmc

AME
next to personal contact,
the best way to keep in touch!



Open Forum

The Big and the Small — Should the twain meet?

The case for and against running 5" and 7¼"gauge trains together

Ross Bishop-Wear's comment in the March-April 1995 AME prompted a very good response. I have placed the letters together in this new section to provide a space for the discussion to flow unhindered by other matters.

This matter was raised at the AALS meeting at Townsville and the following decision was made:

- Regarding large versus small locomotives, QSMEE put forward a motion to limit locomotive sizes. The Adelaide Miniature Steam Railway put forward a motion to segregate locomotives on dual gauge track. After much debate it was agreed that these restrictions were a matter for individual societies to evaluate their own situation regarding loading gauge clearances and axle loading, and to formulate rules and guidelines for their own situation. It will be the individual society's responsibility to inform visitors of any such restrictions.

Sir,

The Editorial Comment by Ross Bishop-Wear on "The Big and Small — Should the Twain Meet?" was stimulating and provocative. While the author proclaimed he had no bias, his proposal to separate the operation of 5" and 7¼" trains seemed to demonstrate a misunderstanding of the inherent compatibility of both gauges, their need to co-exist in Australia for economic reasons, and the need to take into account the impact of scale on future operational practices.

There is no doubt that "safety first, safety always" must be the cornerstone of clubs' operating rules. With the larger and heavier locomotives and rolling stock now running on 7¼" gauge there is generally greater awareness and concern for appropriate signalling, braking systems and the training of crews as "Amusement Structure" operators than for 5" gauge.

7¼" gauge has in fact blazed the way for improved operating standards and these standards will progressively flow back to 5" gauge for a number of reasons.

Firstly, due to the strong following of devotees to 5" gauge it is likely that there will be a progressive move to more powerful narrow gauge locomotives and rolling stock (which give greater hauling power and easier operating characteristics for passenger haulage). 5" gauge engines scaled down from 2'6" sugar plantation locos, 3' gauge mining railways of the Americas, 3'6" gauge British colonial lines and the metre gauge lines of Europe will all provide a rich harvest in styles and wheel arrangements, albeit at the expense of loading gauge and overall mass.

Many of these engines are just as large as the smaller 7¼" gauge locomotives and are well within the capacity of hobby lathes without introducing too much of the hernia problem!

Secondly, we cannot rely on the argument that 5" gauge locomotives built to the diminutive British loading gauge is the measure of what is the norm as the issue of scale drastically changes the equation and will be in fact the catalyst to further change the face of 5" operations over the next 20 years.

Thirdly, Australia simply does not have the population density to economically sustain an isolationalist policy of separate 5" and 7¼" gauge clubs; ie, there is in fact no fundamental problem is running both gauges on a dual gauge club track as witnessed by the number of clubs now providing this facility without any operational or insurance difficulties.

In conclusion, the only real risk of an accident between or in either gauge is through equipment failure, human error or excessive speed; and those causes are not a function of gauge. The real issue to address is the development of proper safety standards and procedures, braking systems and operator training.

Therefore I don't believe that a policy of virtual "gauge apartheid" is a particularly relevant solution to the main issues facing our hobby in Australia. Perhaps what Ross is probably seeking to define is: "what is the upper limit of 7¼" gauge?" rather than simply draw the line between the gauges which is ultimately divisive and a retrograde step for the hobby.

Clearly the debate should centre on total mass, axle load and loading gauge to define the separation between what I call the hobby miniature railway and the commercial fairground type operation which generally runs on 12" gauge and above.

In this context the following maximum parameters could be applied:

- Engine mass 1,500 kg
- Total train mass 7,500 kg
- Max. axle load 250 kg
- Loading gauge 650mm wide, 1,200mm high

In conclusion may I suggest that the fundamental safety issue is not 5" gauge operating with 7¼" gauge but gauge and scale coupled with sensible track design and safety operating standards. In this context Diamond Valley is a marvellous railway, but it does also typify a variety of scales; ie, 1½", 2", 2½" and 3" scale operating on 7¼" gauge. Just wait until we see a concentration of scale 2ft gauge locos and rolling stock running on 5" gauge, which I suggest will cause more safety problems than we presently have to contend with.

Perhaps Ross should concentrate on developing guidelines for the maximum dimensions allowable in 5" gauge rather than pursue a policy which could split the hobby for all the wrong reasons.

Robert Carlisle
Victoria.

Sir,

The recent editorial by Ross Bishop-Wear in the Mar-Apr issue of AME will I hope create a lot of discussion. Hopefully this will lead to a realistic decision as to the best way to go for the various adherents in the best interests of the hobby as a whole. For there is no doubt that "our" hobby seems to have developed divisions. That is, those who like sheer size, and those who like to build something more moderate. It is not quite as hard and fast as that, but almost. Like Ross, I don't believe I am biased, just realistic. When I have finished the two 38s I have under construction in 5" gauge. I intend to build a loco in 7¼ gauge. So, I hope I am looking at this objectively.

Thank you Ross for bringing this topic out into the open; I believe we are all indebted to you for that. I for one am in complete agreement with you and support your contention of "separation". It is warranted on the grounds of safety alone! However, it seems to me that you could also add axle loadings imposed on tracks by locos of the size now commonplace on tracks of combined gauges. Also, coming up with a set of points to suit wheel profiles of the 5" and 7¼" gauge extremities is difficult to say the least.

Let's draw breath and give this problem careful consideration. Personally I believe the two gauges have now become incompatible as regards running dual. Whether the large-scale fraternity should go their own way as Ross suggests should be considered, perhaps along with other alternatives.

If Brian Carter doesn't mind me quoting him I believe he also supports the case as in the May-June 1994 issue of AME he states: *one of the track features I liked was the separation of the 5" and 7¼" gauge tracks for 90% of the journey. They came together long enough for both gauges to share the* *same station facilities, then went on their own way once more. This feature should be emulated at every dual gauge track to allow locos of different sizes to set their own pace.* Perhaps in Brian's recommendation lies the perfect solution!

Some years ago I witnessed several collisions at a convention where a loco of ample proportion (7¼" g) ran into the rear of a much smaller loco (5" g) on more than one occasion! Fortunately no injuries occurred, but some damage to the smaller loco was sustained. It turned out this "monster" had no brakes! I was unable to attend the run at Wagga Wagga some time ago but a friend who did came back with tales of a huge Rio Grande loco that simply dominated all around it (see AME Issue 53 - a magnificient piece of work, but ain't it huge!). To be on the track at the controls of my smallish 5" gauge Adams Tank with one of these large scale monsters bearing down on me gives me grave misgivings. Realistically, the two ought to be on separate tracks. Look up AME Issue 56, page 19 and have a look at something really BIG! Can you imagine a Simplex or a Blowfly ahead of a loco of this size? It's simply not realistic but in my opinion it *is* dangerous.

It seems to me that clubs in the process of designing tracks, those that are revising their layouts, those that are extending and those who may have to re-locate (Tullamarine Society comes to mind) should give very serious thought to the concept of separation of the two gauges. Let's have a reasoned and rational debate about this aspect of our hobby. I re-iterate I believe Ross has done our hobby a great service by bringing this matter out into the open for a full and frank discussion before an accident does occur to the detriment of us all.

Les Phillips
VIC

To maintain editorial even-handedness I prefer not to get involved in the debate. The people who have contributed so far are doing a fine job for themselves. All I ask is that you consider the feelings of the "other" gauger and don't turn this discussion — either verbal or through AME — into a slanging match.

The quote Les was referring to was from an article on the Lake Macquarie Live Steamers. They have the space to separate the two gauges — most clubs don't. I won't deny that my sentiment on this point was strong at the time. However, my own thoughts on this debate have changed in light of discussion with various modellers of both gauges.... bmc

Sir,

The Politics of Driving and the Doctrine of Separation of Powers:

At the November 1994 Wagga Wagga Invitation Run, I decided to sit back and watch, particularly the style and techniques of driving. What I saw provided a frame work for these thoughts. I stress that I am not out to have a shot at any individual or club: simply, I wish to raise these issues for discussion.

In full size, successful and safe train operation is the product of the combined skills of the crew, both as individuals and, importantly, as a team. But a model engineer is the sole footplate player: he or she must fire and drive! There is only one set of eyes to watch the track, signals, water, fire, pressure and hopefully, cast a glance back along the train even with the luxury of a guard! You may be tempted to argue that it is no wonder the hobby experiences the occasional rear-ender. But I will argue that we can no longer be so dismissive or complacent.

The trend for new locomotives is fast becoming "bigger and beefier". Even with a dozen loaded cars behind them, the current crop of behemoths are largely untroubled. However, with the more usual loads, these beasts do not teach you much about the art of driving and managing a locomotive. As someone said to me, they teach you to be lazy. If you really want to learn what driving is all about, load up a rake of wagons behind a small loco and try a few dozen laps around a track that has some decent undulations (such as depicted in AME's first video production: *24 Hours of Live Steam*).

At the other end of the scale, consider the performances regularly displayed on 5" gauge tracks such as West Ryde and Galston. I have watched Reg Watter's GWR Manor and train skillfully handled on many occasions, either single or double-headed. The overwhelming impression is consistency, skill and a good appreciation of driving to the locomotive's abilities in the prevailing conditions. I'll come back to this latter point.

Many people feel that if they can get their train started and keep it moving, they've done their job well. Sorry, but there is still the issue of stopping it again — safely! Having watched many sliding stops on the descending approaches to Wagga Wagga's station, it was apparent that loaded two-car trains were using engine brakes only on the wet, oily track. Under these conditions, is it just a matter of time before we have a major rear-ender somewhere in Australia? I have seen the result of a large 5" gauge loco ramming the back of a 7¼" gauge train — I dread the same happening the other way around but it has happened, as those at the 1992 Tullamarine Convention can attest.

Despite some division in the ranks caused by 1994's Wollongong convention being only 5" and 3½" gauges, the benefit seen by many people was the freedom of the smaller sizes not having to look worriedly over their shoulder if they had to pull up in any hurry. Yet many convention participants are there for the fraternising as much as the running. We may run the risk of not getting the attendance numbers by excluding any gauge from running — perhaps that's what is wanted? — unless you start allocating alternate days or a morning/afternoon regime. Wollongong '94 wasn't the only year to segregate the gauges: some time ago, Moorabbin looked after the 5"/3½" delegates while Diamond Valley hosted 7¼" players. Speaking to some of those who attended, it became obvious that many felt they had divided loyalities — it destroyed the feeling of inclusion.

There are a number of ways to achieve some semblance of equity but the bottom line will still probably be a level of dissatisfaction, if not unhappiness, amongst the numbers. Segregating running days for different groups (whether the division be wrought along size or gauge) can potentially split the hobby.

There are three ways to split the gauges:

a) parallel tracks on the same general alignment:

b) totally separate tracks which only come as close to each other at either side of the platform, as at Albury or Port Pirie:

c) only one gauge for the club (as at Diamond Valley).

Option **a** is costly in real estate for roadbed width to run the two gauges parallel, and inevitably, you have the problem when one gauge needs to cross the other.

And if you have separate tracks for each gauge as per **b**, do you penalise the larger 5" gauge locos with more restricted runs, as at Castledare? There are many 5" gauge locos capable of going the distance currently enjoyed only by the 7¼". Who is the Goliath now? In the wrong hands, locos can be dangerous on any gauge.

Returning to the annual AALS convention: it is eagerly awaited by many as a chance to revisit acquaintances, drive on different tracks, swap notes (and yarns) and compare locos. I view it as the big melting pot of the hobby. My understanding is that a motion was put to the AALS meeting at this year's convention, requesting that the gauges be separated. If this is the perceived solution to the problem of "separating the big and the small" (as Ross Bishop-Wear outlines in the last AME editorial), then I fear we have missed the signal. The problem is not how big the locomotive is or what gauge it runs on but simply how it is driven. You can have large locos handled with safety and little ones that are a hazard.

Many participants of our hobby say that is just that — a hobby — and they enjoy the relative freedom from the reams of regulations and restrictions our full size bethren are now facing. That's fine when the public is not involved. However, as Ross implies, as soon as you open the gate and take the public on board, then you have a whole new level of responsibility. In this increasingly litigious society, we cannot expect common sense and fair play to rule if a member of the public is injured.

I have heard mention of driver licensing or certification at some clubs. This raises many issues, such as:

a) How does this work when drivers from other clubs turn up, either a lone visitor or an Invitation Run/Convention?

b) How do you get a common standard and minimum acceptable level of expertise accepted across the whole plethora of clubs?

c) How is a driver's proficiency to be tested, by whom and how often?

d) Who examines the examiners?

e) Do we license for gauge, for locomotive and/or train size or for the driver's age and/or level of experience?

f) Do we separate the licensed from the non-licensed on the track, particularly on public running days?

g) How are novice drivers expected to accrue their skills — do we bombard them with theory before letting them loose with a loco?

While the number of participants in our hobby expands, and likewise, the size of the motive power, can we really expect that the freedom from regulation enjoyed during earlier days will persist? Conversely, are we also to accept that our congregating is to be limited by an arbitrary border based on gauge alone? I hope not.

I feel it comes down to common sense and the old adage "Drive to the prevalling conditions" whilst a working knowledge and appreciation of basic safe working practice won't go astray. One final question: If you come to a standstill somewhere out on the track, what's the first thing you do? Definitely not bury your head in the cab or admire the scenery...!

Melanie Dennis
ACT

Sir,

Well, the 5/7¼" gauge debate has finally come out of the closet! We all owe Ross Bishop-Wear an accolade for having the intestinal fortitude to bring the grumblings out into the open via the Comment column in AME. This can only do our wonderful hobby good.

Let's hope the debate remains just that, a debate, and that it does not develop into an acrimonious slanging match between the so-called two sides.

Having said that, can I possibly put my two bob's worth in? I have only been actively involved in miniature railway operations for just on ten years and driving for eight of them, so maybe I don't speak with a great deal of experience. But I have certainly made it my business to be observant, and have hopefully learnt from these observations, especially where I have seen operational problems arise.

The problems

To me, there are two main problems which regularly arise on mixed gauge tracks. They are as follows:

- The most common operational problem on mixed gauge tracks is the rear-end shunt (rear-end collision).
- The next most frequent problem is that 5" gauge equipment seems to suffer from more frequent derailments on mixed gauge tracks.

The observations

- 5" gauge trains generally run slower than do 7¼" gauge trains.

The average speed of 5" gauge trains at public running is close to 5 km/h. The average speed of 7¼" gauge trains is close to the AALS recommended maximum of 8 km/h. I suppose this makes sense because, generally, the driving wheel diameter of 5" gauge locomotives is smaller than the larger gauge.

From the above observation it can be seen that the trains on mixed gauge tracks run at different speeds for what their drivers call "comfortable" speed. For example, a 5" gauge *Simplex* would feel comfortable at about 4 km/h and a 7¼" gauge *Black Five* at close to 8 km/h.

Now if they are on the same track, it is inevitable that the much larger diameter driving wheeled engine will catch up to the smaller engine. The results of this catch-up have been seen all too often.

- 7¼" gauge trains are usually much heavier than equivalent 5" gauge trains. (see Note 1)

As a result of running faster and being heavier, the larger gauge trains have much more inertia and thus usually have longer stopping distances than do their smaller bretheren. Hence the results of a rear-end shunt are usually more spectacular, especially so when the larger runs into the back of a smaller train.

If I may use the analogy, if a heavy road vehicle runs into the back of another truck, then the offenders' cab gets crumpled and the driver feels a bit crook (injured or embarrassed or both). Now if a truck runs into the back of a small family sedan, the truck gets a few scatches, but the family car (and its contents) is flattened.

The "emergency stop" is a problem with larger equipment. With all but the heaviest 5" gauge train, two size-tens planted firmly into the ballast will soon stop the train. With the bigger trains, the inertia dictates that this is impossible. With the larger narrow gauge locos (which seem to be the majority in the larger gauge these days), the feet are planted firmly inside the confines of the tender, which makes a "plough" stop impossible.

[*Note 1.* An exception to this is the 5" at SLSLS West Ryde, where they run fully braked trains with a gross weight of around two tonnes. However, their safe working procedures and highly disciplined crews ensure they don't have the problems discussed here.]

- 5" gauge trains have problems with staying on the track at mixed gauge (third common rail) points.

There is a wide disparity of wheel standards across the range from 5" gauge fine scale to 7¼" narrow gauge. Now mixed gauge tracks must be built to the 7¼" standard which must accommodate narrow gauge flanges.

There doesn't appear to be much of a problem when pointwork is new, but after some years of operation, frogs and checkrails start to wear and this is when the problems begin for the 5" finescale wheeled equipment.

The fixit

This is the crunch part. We really need to be brutally honest here. The fact is, the incidence of problems on 5/7¼" mixed gauge tracks is much higher than on single gauge tracks, for the reasons given above.

Now we have had years of asking and trying to educate people to be patient and to refrain from "tailgaiting". It just isn't happening. Hence the continuing incidence of rear-end shunts. So it is safe to presume that future urgings will be similarly ignored. We are not going to stop rear-end collisions!

So, the only way I can see to minimise the impact (pardon the pun) of rolling stock and people damage is to keep like-sized equipment colliding. This means separating the gauges in any area where the public rides. I can hear the screams already!

By this I mean that all public carrying main and branchline 5" and 7¼" gauge tracks are separate. The loading bays, steaming roads, storage roads and marshalling yards could be still be dual gauge.

The only concessions to dual gauge that could be considered may be in a single line passenger loading road in a station, where for safety of passengers it would be impracticable to have lines close side by side. In this case, the track could be gauntleted, with interlocked catchpoints at each end. Where you need a run-around loop, separate 5" and 7¼" outside passenger roads would be required, with a gauntlet centre loop road with suitable mechanical interlocking of the common road. The common loop road is purely a space saving exercise, i.e. three roads instead of four.

Summary

The majority of clubs are metropolitan based, so with their larger memberships and economies they should be able to cater for two mainlines. The regional clubs are a different matter. If their membership numbers are low, then during the clubs' foundation years they need to decide which way they will go, 5" or 7¼".

As Ross Bishop-Wear has previously said, could alternate running be considered as a solution on existing dual gauge tracks? Say 5" for the first three hours' running and 7¼" for the remainder, or vice versa.

Is it too much to ask that in the interests of safety, the gauges should consider separation (one way or another) on the public carrying lines? It is a very difficult question, but unless it is addressed sensibly and rationally and resolved, then we may all rue the day we buried out collective heads in the sand, hoping it would go away!

Graeme Roberts
NSW

Product Reviews

REMEMBER WHEN...

The Railways of NSW -1950s Plus

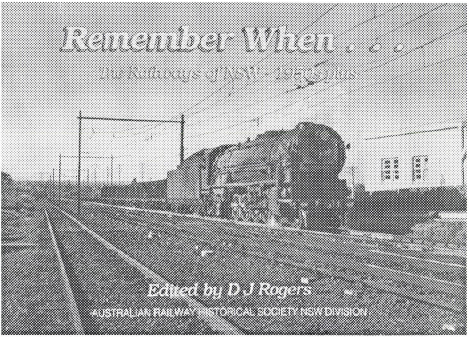
Edited by Derek Rogers.

Many photographers have a cupboard full of memories — photographs either good or indifferent, depicting events which they have witnessed over the years. For this book, a group of dedicated and well known railway photographers, together with Derek Rogers, have sifted through their private collections and part of those held by ARHS Archives. The product is a full-colour pictorial reminder of how the railways of NSW looked just thirty to forty years ago.

The book photographically presents government (and some private) railway operations in NSW in a comprehensive manner showing locomotives, rolling stock and facilities as they were at a time of very significant change, resulting eventually in what people in NSW either use, view, or regret in today's vastly different rail system.

The book is hard bound and contains 112 A4 size pages, laid out in the less common landscape or horizontal format. While the book is not as convenient to place on the average bookshelf, the many full-page prints are displayed to best advantage. Excellent reproduction on good quality gloss paper together with a fine black border on all part-page photographs, ensures excellent presentation of the 200-plus prints used. The concise explanatory text is in bold type and easily read.

Readers will note varying colour quality in the photographs. Colour photography was still in its relative infancy at the time the shots were taken, with film emulsions lacking the stability and speed of today — ASA 10 to 25 being the normal types in the 1950s. These "slow" films severely restricted the shutter speeds that would stop moving subjects and restricted the time of day when light was adequate without resorting to tricky time exposures — although several excellent examples of these are depicted in the book.


Remember When . . .
The Railways of NSW - 1950s plus
Edited by D J Rogers
AUSTRALIAN RAILWAY HISTORICAL SOCIETY NSW DIVISION

A wide selection of areas is represented in the book, broken up into the usual Metropolitan, South Coast, Main South, West, North and North Coast regions. The book is not intended to cover the complete NSW network of the time: in fact it is a credit to the photographers that they were able to get to some of the locations depicted, this being an era of poor roads, FJ Holdens and pushbikes. It was a time when holiday travel was still normally by train and it took "all day plus" to get there.

While this book essentially covers railway operations, it is most interesting to look into the surroundings depicted in the photographs. The views of Sydney without high-rise, and of Darling Harbour when it was the congested hub of commercial trade and transport rather than today's shiny showpiece, are rather unbelievable to us now.

Many readers will expect this to be a "steam only" album. The majority of the photos are, but diesel and electric traction is included, many of the subjects depicted being new then but totally withdrawn today. How many of us can actually remember the original green liveries of the 40 and 41 classes or the brand new tuscan 42s, 43s and 48s with their yellow and red trim? This book serves to bring all those memories flooding back to the seniors among us or to show the younger generations what it was like then.

Remember When... presents an excellent history lesson on a time not so long ago. I recommend it as a valuable addition to your reference collection.

Price: reduced to $54.95 for the first 20 copies sold, then the normal price of $59.95 thereafter — both prices posted Australia wide.

Available from: AME Retail
PO Box 355, KOORINGAL, NSW, 2650

Les Mouat

Miniature Live Steam in Australia

A Directory of Societies

This booklet, compiled by Kenith Tinkler, is now in its twelfth year of publication! It has proved to be a valuable asset to the travelling model engineer: in fact, copies of this directory can be found all over the world. The 1995 issue has just been released.

The booklet is laid out with information on the basis of one club per page. Fortunately, only a few clubs failed to respond to Ken's request for information. These clubs have name and address listed only. This means that you can discover details, in 21 data fields, of just about every club in Australia!

The data fields include: club name; track address; postal address; president; secretary; formation date; in-house publication; track details — gauge, length, type, max. grade; min. radius; boiler inspectors; running days — club, public; loading gauge; steam raising facilities; society meeting — time and place.

AME's *Club Roundup* publishes some details from our own club list from time to time, but this booklet has all of the details, plus much more, in one go!

Two sizes are currently available: a handy A5 glove box / camera bag size, and a larger A4 size for those who find small print difficult to read.

Whether you travel or not, this booklet is a "must-have" to enable you to keep in touch with clubs around Australia. Now, what about New Zealand?

Price: A5 is $8.25 and A4 is $13.25. Both prices include post and packaging Australia wide.

Available from: Kenith Tinkler,
79 Rowans Rd, MOORRABBIN, Vic. 3189
Phone: (03) 9555 1171

Brian Carter

News Desk

Compiled by Brian Carter

Greetings once more. I can't believe we're half way through the year already! Thanks to those who took the time to note a few comments on the back of the subscription renewal forms. These are always good value: it helps us to gauge your reaction to the content of the magazine. There have been a few constructive criticisms that have been noted. By and large the support for the present format and content has been very good.

AME Retail

Les Mouat has gone to Europe for a short holiday from 18 June to 7 July. The mail to the Kooringal address will still be attended to. However, those with credit card payments may have to wait until Les returns before the goods can be processed. I apologize for any inconvenience caused.

Can you help?

Robert Fox has been looking after subscriptions and back issues since we kicked off the new AME in November 1990. Rob is willing to continue with the back issue management, but would like to pass on the subscription database management to someone else. The magazine is growing and we need to share the load a little further than we used to!

If you would be willing to help in this area, please call me. This is another honorary position, like all on AME. Because of the tight lead times we would prefer someone in the Sydney Basin area, i.e. within Newcastle-Katoomba-Nowra. radius of Sydney.

AME advertising

Advertising is another growth section of AME. At present I am doing this myself, but I am finding that the magazine page layout is beginning to suffer because of the time taken to remind the advertisers of the deadline date, etc. If you feel you could help in this area please call me and I'll fill you in on the details. You can live anywhere in Australia for this interesting job.

Just another sign of the popularity that AME is enjoying at the moment; long may it continue!

The S wagon prototype story

The S wagon story in the April issue of Australian Model Railway Magazine was excellent. It certainly covered all of the aspects of this ubiquitous wagon. I was pleasantly surprised when the June issue of AMRM arrived with another large helping of S wagon information. I thought it was just going to be a summation, but it is nearly as long as part one! There is also a good section on commercially available model S wagons (N to O gauge), covering brands long since defunct as well as new-kids-on-the-block!

Model theft

See Maritime Matters for details of a boating theft.

Some good news! Some time ago AME reported the theft of a large quantity of models, including a locomotive, boat, and stationary engines. All I can say at the moment is that some have been found. A reader was looking through some AME back issues for something and saw the description by accident. Unwittingly, the reader had seen one of the models for sale recently. The matter is in the hands of the police.

Security

AME has highlighted, from time to time, the need for secure premises to store your models and equipment. An alarm system is fine, and a step in the right direction. However, what do *you* do when you hear an alarm sounding? Roll over and continue sleeping? Complain about the noise? Call the police and give all the details? Don't care?

Not many get reported to the police, because there are too many false alarms. And many neighbours are complacent.

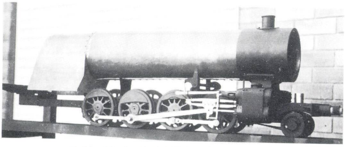
We will never stop theft, but you can slow it down easily. Fit secure locks, preferable deadlocks, to all your workshop/garage/storeroom doors. Make up a special lock for your roller or tilt garage door. You could add steel bars to the inside of the windows so they don't look obtrusive from the outside. These things are easy to make yourself.

Would-be thieves have more trouble with home-made security devices than off-the-shelf proprietary gadgets — they have no way of knowing, in advance, how they work.

Trade and commercial

Hobby Mechanics of Kenmore, Queensland, have many thousands of *Model Engineer* (UK) back issues for sale. A photograph of their Queensland Rail AC16 steam loco, under construction by Neil Mackenzie, is included below. The details of castings/prices can be found elsewhere in this issue.

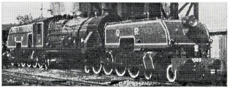
Camden Miniature Steam Services (UK) have sent a copy of their *Sterling Engine Manual* for review. It arrived too late for a full review in this issue. However, the book looks very good with a lot of information that takes much of the mystery out of these interesting engines. Also included are plans and descriptions of many working models covering just about every different type of sterling engine available. A full review will be in the next issue of AME.



Hobby Mechanics' AC16 under construction.

1009 re-visited

Saturday 20 May 1995 was an exciting day in the world of Garratts! 1009 steamed out of Roma Street station at 9.15am, heralding a return to "big" steam on the Queensland tourist trains.



1009 was Queensland Rail's first Beyer Garratt locomotive in service, commencing traffic work on 22 September 1950 — QR had 20 Ausralian Standard Garratts in 1945. 1009's working life was relatively short for a steam locomotive. It featured in the QR centenary celebrations during 1965, by hauling a 12 coach train from Brisbane to Grandchester. By 1969 all QR Garratts had been withdrawn.

In September 1993, the 1009 was road-hauled to Ipswich workshops for restoration to working order.

On Saturday 20 May 1995, 1009 hauled a train of vintage end-platform coaches from Roma Street over the route followed by the West Morton coal trains from the mine at Ebenezer to the port at Fisherman Islands on Brisbane's south-side. It was the first time a Garratt had travelled this route, as the lines to both Ebenezer and Fisherman Islands were built after they were withdrawn from service. The tour was organized by SunSteam Inc. a non-profit association interested in preserving QR heritage equipment.

Martin Johncock will donate part of the proceeds of his print sales to help the ARHS Qld Division restoration programme You can help too by purchasing a print as advertised on the back page.

1009 is currently the only full-size working Garratt locomotive in Australia!

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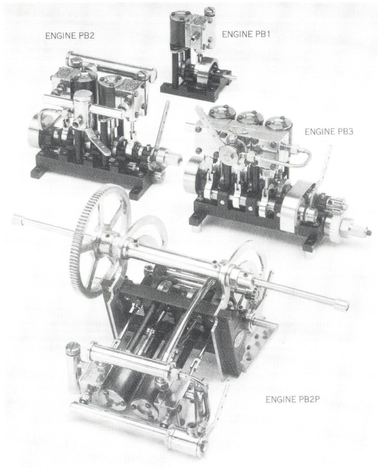

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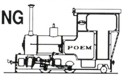

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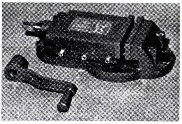

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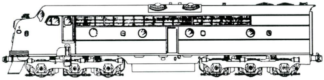

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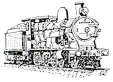

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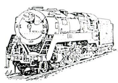

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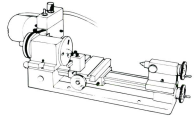

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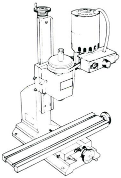

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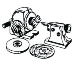

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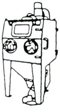

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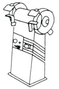

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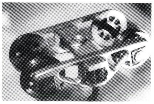

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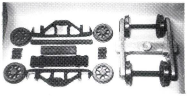

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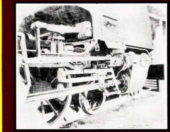

Pencil study 540 x 500

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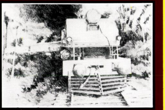

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